Form 3.2-1 Administrative Topics Outline

Facility: Millstone Unit 2		Date of Examination: 09/12/2022
Examination Level: RO ☒ SRO ☐		Operating Test Number: ES22L1
Administrative Topic (Step 1)	Activity and Associated K/A (Step 2)	Type Code (Step 3)
Conduct of Operations (A1R)	K/A 2.1.23 Ability to perform general and/or normal operating procedures during any plant condition. (RO 4.3) Perform a batch makeup calculation to raise VCT level.	R,M
Conduct of Operations (A2R)	K/A 2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management. (RO 4.3) Determine Shutdown Margin.	R,M
Equipment Control (A3R)	K/A 2.2.44 Ability to interpret control room indications to verify the status and operation of a system and understand how operator actions and directives affect plant and system conditions. (RO 4.2) Evaluate an RCP Seal Failure.	R,M
Radiation Control (Spare)	K/A 2.3.12 Knowledge of radiological safety principals and procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas or alignment of filters. (RO 3.2) Determine access requirements to a locked high-radiation area .	R,N
Emergency Plan (A4R)	K/A 2.4.21 Knowledge of the parameters and logic used to assess the status of emergency operating procedures critical safety functions or critical shutdown safety functions. (RO 4.0) Use RATS to Determine and Prioritize the Safety Functions.	R,D

Instructions for completing Form 3.2-1, “Administrative Topics Outline”

1. For each license level, determine the number of administrative job performance measures (JPMs) and topic areas as follows:

Topic	Number of JPMs	
	RO*	SRO and RO Retakes
Conduct of Operations	1 (or 2)	2
Equipment Control	1 (or 0)	1
Radiation Control	1 (or 0)	1
Emergency Plan	1 (or 0)	1
Total	**4**	**5**

2. Enter the associated knowledge and abilities (K/A) statement and summarize the administrative activities for each JPM.

3. For each JPM, specify the type codes for location and source as follows:

   Location:

   (C)ontrol room, (S)imulator, or Class(R)oom

   Source and Source Criteria:

   (P)revious two NRC exams (no more than one JPM that is **randomly selected** from last two NRC exams) (0)
   (D)irect from bank (no more than three for ROs, no more than four for SROs and RO retakes) (1)
   (N)ew or Significantly (M)odified from bank (no fewer than one) (3), Spare (1)

A1R Perform a batch makeup calculation to raise VCT level (Modify Bank 291, NRC 2016)

The examinee will perform a calculation for a Batch Make Up to raise the Volume Control Tank (VCT) from 70% to 85%. The examine will specifically provide; 1) the total gallons to raise level, 2) gallons of Boric Acid from the Boric Acid Storage Tank (BAST), and 3) gallons of Primary Makeup Water (PMW). The bank JPM is modified by changing the amount the level will be raised and the BAST concentration. All answers of the modified JPM are different from the bank JPM.

A2R Determine Shutdown Margin (Modify Bank A1.2R, NRC 2017)

The examinee will determine the required Shutdown Margin (SDM) for the stated conditions and require SDM is met. The bank JPM is modified by changing the Core Average Burnup, the current RCS Boron concentration, and removing one Control Element Assembly (CEA) being fully withdrawn. This changes the required Shutdown Boron concentration as well as other aspects of the JPM.

A3R Evaluate an RCP Seal Failure (Modify Bank 276, NRC 2016)

The examinee will evaluate the conditions of a RCP with seal degradation. Report which stage(s) are failed or degraded and specify procedural actions based on the RCP seal stage conditions. The JPM is modified based on a different procedure for RCP Malfunctions (new procedure is AOP 2586. RCP Malfunctions and procedure in the bank JPM 276 is OP 2301C, Reactor Coolant Pump Operation). The JPM will be performed as an Admin JPM in the simulator (could also be performed in the classroom with computer printout), with the examinee using Alarm Response Procedures (ARPs), AOP 2586, and the Plant Process Computer (PPC) to interpret control room indications to verify the status and operation of a system. Then once an assessment of the conditions in determined specified the required procedurally required action.

A4R Use RATS to Determine and Prioritize the Safety Functions (Bank A4RO, NRC 2005)

The examinee will correctly identify and prioritize the Safety Function Success Paths. Given a list of post shutdown plant parameters the examinee with use the Resource Assessment Tress (RATs) and Safety Function Status Checklist (SFSC) to prioritize the Safety Function Success Paths and specify the first emergency operating procedure to be entered based on the assessment. This will require some modification based the procedure revisions since the last time it was used.

SpareA4R Determine access requirements to a locked high-radiation area (New)

The examinee when provided a Radiation Work Permit (RWP) and a Survey Map will determine the entry requirements to enter a high-radiation area.

Form 3.2-1 Administrative Topics Outline

Facility: Millstone Unit 2		Date of Examination: 09/12/2022
Examination Level: RO ☐ SRO ☒		Operating Test Number: ES22LI1
Administrative Topic (Step 1)	Activity and Associated K/A (Step 2)	Type Code (Step 3)
Conduct of Operations (A1S)	K/A 2.1.5 Ability to use procedures related to shift staffing, such as minimum crew complement or overtime limitations. (SRO 3.9) Ensure Compliance with Fatigue Rule.	R,N
Conduct of Operations (A2S)	K/A 2.1.42 Knowledge of new and spent fuel movement procedures. (SRO 3.4) Assess the impact of a damaged door on plant activities and suspend fuel movement.	R,D
Equipment Control (A3S)	K/A 2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operation. (SRO 4.2) Review and accept a Pressurizer Heater Capacity Test.	R,N
Radiation Control (A4S)	K/A 2.3.6 Ability to approve liquid or gaseous release permits. (SRO 3.8) Review and approve a Radioactive Gaseous Waste Discharge.	R,N
Emergency Plan (A5S)	K/A 2.4.41 Knowledge of the emergency action level thresholds and classifications. (SRO 4.6) EAL Classification.	R,D
Conduct of Operations (Spare)	K/A 2.1.23 Ability to perform general and/or normal operating procedures during any plant condition. (SRO 4.4) Perform a Shutdown Safety Assess review for the predicted condition of the RCS in Reduced Inventory.	R,D

Instructions for completing Form 3.2-1, “Administrative Topics Outline”

1. For each license level, determine the number of administrative job performance measures (JPMs) and topic areas as follows:

Topic	Number of JPMs	
	RO*	**SRO and RO Retakes**
Conduct of Operations	1 (or 2)	2
Equipment Control	1 (or 0)	1
Radiation Control	1 (or 0)	1
Emergency Plan	1 (or 0)	1
Total	**4**	**5**

2. Enter the associated knowledge and abilities (K/A) statement and summarize the administrative activities for each JPM.

3. For each JPM, specify the type codes for location and source as follows:

   Location:

   (C)ontrol room, (S)imulator, or Class(R)oom

   Source and Source Criteria:

   (P)revious two NRC exams (no more than one JPM that is **randomly selected** from last two NRC exams)
   (D)irect from bank (no more than three for ROs, no more than four for SROs and RO retakes)
   (N)ew or Significantly (M)odified from bank (no fewer than one)

A1S Ensure Compliance with Fatigue Rule – (New)

Examinee will determine which Reactor Operator(s) is/are available to work and meet the Fatigue Rule requirements. The examinee will be provided the schedule of (4) Operators and the Fatigue Rule procedure. They will then determine which if any operators are available to work the next dayshift.

A2S AEAS Broken Boundary Door – (Bank JPM-297, 218)

Examinee will assess the impact of a damaged door on plant activities. Using the provided OP 2356, Doors procedure they will determine that the door is a Spent Fuel Pool Ventilation Boundary (AEAS) and Technical Requirement Manual (TRM) Fire door. Based on the information determine from OP 2356, the initial conditions, and provided procedure OPS-FH-216, SFP Fuel Handling Operations, the examinee will suspend fuel movement. In addition, the examinee will establish a continuous fire watch on at least one side of the fire rated assembly.

A3S Review and accept a Pressurizer Heater Capacity Test – (New)

Examinee will review a completed Pressurizer Heater Capacity Test surveillance for acceptance. Upon review the examinee will determine that an error has been made and that the surveillance acceptance criteria for Proportional Heater power is not met. The examinee will not accept the surveillance. The examinee will assess the failed surveillance and enter the Pressurizer Technical Specification, 3.4.4.b. This is a condition the plant has experienced as a result of Pressurizer Heater failures.

A4S Review and approve a Radioactive Gaseous Waste Discharge – (New)

Examine will review a gaseous waste discharge permit and surveillance form and identify that the discharge can't be authorized as currently prepared. The examinee will be provided with all the required paperwork to authorize the discharge. They will identify that the Alert and/or Alarm radiation monitor setpoints are not correct and that a required verification has not been performed. Based on these two incorrect conditions the examinee will determine the discharge can't be authorized.

A5S EAL Classification – (Bank JPM-161)

Examinee will be given at set of plant conditions. Given this information and the Emergency Action Level (EAL) matrix the examinee will correctly classify the event within 15 minutes. Once the Classification is made the examinee will then be given updated plant information. They will use this information to make a second correct classification within the next15 minutes. This is a bank JPM. Millstone replaced their EAL tables in late 2020 and these are completely new tables.

(Spare) Shutdown Safety Assessment Review for Reduced Inventory Conditions – (Bank JPM-295)

Examinee will be provided with the current plant conditions and a predicted Shutdown Safety Assessment (SSA) for entering RCS Reduced Inventory. The examinee will review the SSA and determine that there are two errors in the assessment.

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: Millstone Unit 2 Date of Examination: 09/12/2022

Operating Test Number: ES22L1

Examination Level: ☒ RO ☐ SRO-I ☐ SRO-U

System/JPM Title	Type Code	Safety Function
Control Room Systems		
a. S1 Emergency Boration - Alternate Path (K/A 004 A2.14, RO IR 4.0)	A,D,L,S	1
b. S2 LPSI Pump Failure to Trip Post SRAS – Alternate Path (K/A 006 A3.02, RO IR 4.2)	A,D,EN,L,S	2
c. S3 Forcing Pressurizer Spray – Alternate Path (K/A 010 A2.02, RO IR 4.5)	A,M,S	3
d. S4 Pumping the Containment Sump – Alternate Path (K/A 103 A3.01, RO IR 4.2)	A,D,S	5
e. S5 Respond to an Open Phase Condition (OPC) – Alternate Path (K/A 062 A2.16, RO IR 3.7)	A,L,N,S	6
f. S6 Power Range Safety Channel and Delta T Power Channel Calibration (K/A 012 A4.02, RO IR 3.8)	D,S	7
g. S7 Respond to the Loss of a 2nd Circulating Water Pump – Alternate Path (K/A 075 A2.02, RO IR 3.9)	A,D,S	8
h. S8 Verify Control Room Air Conditioning System in Recirculation In Response to Radiation on RM 9799A/B (K/A 050 A4.01, RO IR 3.8)	M,S	9
In-Plant Systems		
i. P1 Shift CAR RBCCW Valve to Local Manual (K/A 022 A4.04, RO IR 3.5)	D,E,L,R	5
j. P2 Shift AFW Pump Suction to Firewater (K/A 061 K1.07, RO IR 4.2)	D,E,L	4
k. P3 Transferring Computer UPS 480 VAC Main Power Supply (K/A 062 A1.03, RO IR 3.5)	D	6

1. Determine the number of control room system and in-plant system job performance measures (JPMs) to develop using the following table:

License Level	Control Room	In-Plant	Total
Reactor Operator (RO)	8	3	11
Senior Reactor Operator-Instant (SRO-I)	7	3	10
Senior Reactor Operator-Upgrade (SRO-U)	2 or 3	3 or 2	5

2. Select safety functions and systems for each JPM as follows:

   Refer to Section 1.9 of the applicable knowledge and abilities (K/A) catalog for the plant systems organized by safety function. For pressurized-water reactor operating tests, the primary and secondary systems listed under Safety Function 4, "Heat Removal from Reactor Core," in Section 1.9 of the applicable K/A catalog, may be treated as separate safety functions (i.e., two systems, one primary and one secondary, may be selected from Safety Function 4). From the safety function groupings identified in the K/A catalog, select the appropriate number of plant systems by safety functions to be evaluated based on the applicant's license level (see the table in step 1).

   For RO/SRO-I applicants: Each of the control room system JPMs and, separately, each of the in-plant system JPMs must evaluate a different safety function, and the same system or evolution cannot be used to evaluate more than one safety function in each location. One of the control room system JPMs must be an engineered safety feature.

   For SRO-U applicants: Evaluate SRO-U applicants on five different safety functions. One of the control room system JPMs must be an engineered safety feature, and the same system or evolution cannot be used to evaluate more than one safety function.

3. Select a task for each JPM that supports, either directly or indirectly and in a meaningful way, the successful fulfillment of the associated safety function. Select the task from the applicable K/A catalog (K/As for plant systems or emergency and abnormal plant evolutions) or the facility licensee's site-specific task list. If this task has an associated K/A, the K/A should have an importance rating of at least 2.5 in the RO column. K/As that have importance ratings of less than 2.5 may be used if justified based on plant priorities; inform the NRC chief examiner if selecting K/As with an importance rating less than 2.5. The selected tasks must be different from the events and evolutions conducted during the simulator operating test and tasks tested on the written examination. A task that is similar to a simulator scenario event may be acceptable if the actions required to complete the task are significantly different from those required in response to the scenario event.

   Apply the following specific task selection criteria:

- At least one of the tasks shall be related to a shutdown or low-power condition.
- Four to six of the tasks for RO and SRO-I applicants shall require execution of alternative paths within the facility licensee's operating procedures. Two to three of the tasks for SRO-U applicants shall require execution of alternative paths within the facility licensee's operating procedures.
- At least one alternate path JPM must be new or modified from the bank.
- At least one of the tasks conducted in the plant shall evaluate the applicant's ability to implement actions required during an emergency or abnormal condition.
- At least one of the tasks conducted in the plant shall require the applicant to enter the radiologically controlled area. This provides an excellent opportunity for the applicant to discuss or demonstrate radiation control administrative subjects.

If it is not possible to develop or locate a suitable task for a selected system, return to step 2 and select a different system.

4. For each JPM, specify the codes for type, source, and location:

Code	License Level Criteria		
	RO	**SRO-I**	**SRO-U**
(A)lternate path	4–6	4–6	2–3
(C)ontrol room			
(D)irect from bank	≤ 9	≤ 8	≤ 4
(E)mergency or abnormal in-plant	≥ 1	≥ 1	≥ 1
(EN)gineered safety feature (for control room system)	≥ 1	≥ 1	≥ 1
(L)ow power/shutdown	≥ 1	≥ 1	≥ 1
(N)ew or (M)odified from bank (must apply to at least one alternate path JPM)	≥ 2	≥ 2	≥ 1
(P)revious two exams (randomly selected)	≤ 3	≤ 3	≤ 2
(R)adiologically controlled area	≥ 1	≥ 1	≥ 1
(S)imulator			

S1 Emergency Boration – Alternate Path (Bank JPM-257)

Examinee observes the Reactor has tripped and commences Standard Post Trip Actions in accordance with EOP 2525. The examinee will observe and report (2) CEAs have not inserted and perform steps to Emergency Borate in accordance with EOP 2541, Appendix 3. The alternate path occurs after all action steps are completed and a check that Charging flow is greater than 40 gpm is being performed. The examinee will observe Charging flow is less than 40 gpm and take Contingency Actions (alternate path) to start an additional Charging pump to achieve greater than 40 gpm Charging flow.

S2 Respond to LPSI Pump Failure to Trip on SRAS Actuation – Alternate Path (Bank JPM-230)
Examinee will perform actions in the LOCA EOP associated with a Sump Recirculation Actuation Signal (SRAS). The examinee takes actions to realign the Charging pumps from the Boric Acid Storage Tanks (BAST) to the Refueling Water Storage Tank (RWST). Then when SRAS is observed to actuate, the examinee verifies the proper SRAS actuation has occurred. The alternate path occurs when one Low Pressure Safety Injection (LPSI) pump does not turn off, as required. The examinee then takes action to attempt to stop the pump with its handswitch, then when that is not successful, carries out Contingency Actions to reposition LPSI injection valves.

S3 Forcing Pressurizer Spray – Alternate Path (Modified JPM-223)
Examinee will Force Pressurizer Sprays. While performing this evolution a Pressurizer Spray valve will fail partially open. The examinee will perform Immediate Operator Actions to observe Pressurizer pressure safety channels and attempt to manually close the spray valve. When the Pressurizer Spray valve does not close the examinee will take Alternate Path (Contingency Action) to place the Pressurizer Spray valve(s) "Normal/Close" switch to close. This will close the Spray Valve. The "Normal/Close" switch is a new modification to the plant, completed during the last refuel outage, and the Immediate Operator Actions procedure was changed to reflect this modification.

S4 Pumping the Containment Sump – Alternate Path (Bank JPM-211)
Examinee pumps the Containment sump until the receipt of the "CTMT NORM SUMP DIS PRESS HI" annunciator is received. The examinee will observe the annunciator alarm and refer to the Alarm Response Procedure (ARP). The ARP directs that the Containment Sump pump be stopped and the examinee stops the pump. When the pump is stopped one of the discharge isolation valves does not close and the examinee identifies this and attempts to close the valve.

S5 Respond to an Open Phase Condition (OPC) – Alternate Path (New)
This is a new JPM for a recent modification to the plant which includes changes to the Standard Post Trip Actions procedure. The examinee will respond to a plant trip and identify an OPC exists and take action to divorce from the electrical source with the OPC and align to a good electrical source.

S6 Power Range Safety Channel and Delta T Power Channel Calibration (Bank JPM-173)
Examinee will performance a portion of a Reactor Protection System (RPS) calibration using procedure SP 2601D, Power Range Safety Channel and Delta T Power Channel Calibration. The examinee will determine that the +10 Volt power Supply voltage is not in the acceptable range and bypass the channel.

S7 Respond to the Loss of a 2nd Circulating Water Pump – Alternate Path (Bank JPM S8)
Examinee will be directed to perform actions in response to a loss of a Circulating Water pump. They will perform actions to cross-tie Circulating System Waterboxes. Once the Waterboxes have been cross-tied the examinee will identify a second Circulating Pump trip in the same Condenser, and either recommend tripping the plant or trip the plant.

S8 Verify Control Room Air Conditioning System in Recirculation in Response to Radiation on RM 9799A/B - (Modified JPM-232)
The examinee will verify the CRACS system has shifted from the recirculation mode after radiation is detected in the Control Room, on radiation monitors RM 9799A/B. A failure on the operating facility will require the examinee to start equipment on one facility and stop equipment on the other facility, to place one complete facility in the recirculation mode, to protect Control Room personnel.

P1 Shift CAR RBCCW Valve to Local Manual – (Bank JPM-245)
Examinee will simulate placing a Containment Air Recirculation (CAR) fan valve in manual and opening it. The task involves isolating air, aligning the manual operator shaft to the valve stem, engaging the lever arm in the manual shaft, and opening the valve. The valve is in the RCA.

P2 Shift AFW Pump Suction to Firewater – (Bank JPM-040A/B)
Examinee will simulate aligning Fire Water to an Auxiliary Feedwater pump. This requires the examinee to open valves from the Firewater System and close a valve from the Condensate Storage Tank. The valves are located in the Turbine Building.

P3 Transferring Computer UPS 480 VAC Main Power Supply - (Bank JPM-116)
Examinee will transfer the Plant Process Computer UPS main power supply from one Vital Facility to the other. This requires checking the main 480 VAC breaker closed, checking UPS switches, operating computer power safety switches, and checking the UPS Inverter operating properly by verifying Inverter indications. The bulk of this JPM is performed in the DC switchgear rooms with a breaker check in the Control Room Air Conditioning equipment room.

Form 3.2-2 Control Room/In-Plant Systems Outline

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Operating Test Number: ES22L1

Examination Level: ☐ RO ☒ SRO-I ☐ SRO-U

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Control Room Systems		
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b. S2 LPSI Pump Failure to Trip Post SRAS – Alternate Path (K/A 006 A3.02, RO IR 4.2)	A,D,EN,L,S	2
c. S3 Forcing Pressurizer Spray – Alternate Path (K/A 010 A2.02, RO IR 4.5)	A,M,S	3
d. S4 Pumping the Containment Sump – Alternate Path (K/A 103 A3.01, RO IR 4.2)	A,D,S	5
e. S5 Respond to an Open Phase Condition (OPC) – Alternate Path (K/A 062 A2.16, RO IR 3.7)	A,L,N,S	6
f. S6 Power Range Safety Channel and Delta T Power Channel Calibration (K/A 012 A4.02, RO IR 3.8)	D,S	7
g. S7 Respond to the Loss of a 2nd Circulating Water Pump – Alternate Path (K/A 075 A2.02, RO IR 3.9)	A,D,S	8
h. S8 Verify Control Room Air Conditioning System in Recirculation In Response to Radiation on RM 9799A/B (K/A 050 A4.01, RO IR 3.8)	M,S	9
In-Plant Systems		
i. P1 Shift CAR RBCCW Valve to Local Manual (K/A 022 A4.04, RO IR 3.5)	D,E,L,R	5
j. P2 Shift AFW Pump Suction to Firewater (K/A 061 K1.07, RO IR 4.2)	D,E,L	4
k. P3 Transferring Computer UPS 480 VAC Main Power Supply (K/A 062 A1.03, RO IR 3.5)	D	6

1. Determine the number of control room system and in-plant system job performance measures (JPMs) to develop using the following table:

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2. Select safety functions and systems for each JPM as follows:

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   For SRO-U applicants: Evaluate SRO-U applicants on five different safety functions. One of the control room system JPMs must be an engineered safety feature, and the same system or evolution cannot be used to evaluate more than one safety function.

3. Select a task for each JPM that supports, either directly or indirectly and in a meaningful way, the successful fulfillment of the associated safety function. Select the task from the applicable K/A catalog (K/As for plant systems or emergency and abnormal plant evolutions) or the facility licensee's site-specific task list. If this task has an associated K/A, the K/A should have an importance rating of at least 2.5 in the RO column. K/As that have importance ratings of less than 2.5 may be used if justified based on plant priorities; inform the NRC chief examiner if selecting K/As with an importance rating less than 2.5. The selected tasks must be different from the events and evolutions conducted during the simulator operating test and tasks tested on the written examination. A task that is similar to a simulator scenario event may be acceptable if the actions required to complete the task are significantly different from those required in response to the scenario event.

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- At least one alternate path JPM must be new or modified from the bank.
- At least one of the tasks conducted in the plant shall evaluate the applicant's ability to implement actions required during an emergency or abnormal condition.
- At least one of the tasks conducted in the plant shall require the applicant to enter the radiologically controlled area. This provides an excellent opportunity for the applicant to discuss or demonstrate radiation control administrative subjects.

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4. For each JPM, specify the codes for type, source, and location:

Code	License Level Criteria		
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(C)ontrol room			
(D)irect from bank	≤ 9	≤ 8	≤ 4
(E)mergency or abnormal in-plant	≥ 1	≥ 1	≥ 1
(EN)gineered safety feature (for control room system)	≥ 1	≥ 1	≥ 1
(L)ow power/shutdown	≥ 1	≥ 1	≥ 1
(N)ew or (M)odified from bank (must apply to at least one alternate path JPM)	≥ 2	≥ 2	≥ 1
(P)revious two exams (randomly selected)	≤ 3	≤ 3	≤ 2
(R)adiologically controlled area	≥ 1	≥ 1	≥ 1
(S)imulator			

S1 Emergency Boration – Alternate Path (Bank JPM-257)

Examinee observes the Reactor has tripped and commences Standard Post Trip Actions in accordance with EOP 2525. The examinee will observe and report (2) CEAs have not inserted and perform steps to Emergency Borate in accordance with EOP 2541, Appendix 3. The alternate path occurs after all action steps are completed and a check that Charging flow is greater than 40 gpm is being performed. The examinee will observe Charging flow is less than 40 gpm and take Contingency Actions (alternate path) to start an additional Charging pump to achieve greater than 40 gpm Charging flow.

S2 Respond to LPSI Pump Failure to Trip on SRAS Actuation – Alternate Path (Bank JPM-230)
Examinee will perform actions in the LOCA EOP associated with a Sump Recirculation Actuation Signal (SRAS). The examinee takes actions to realign the Charging pumps from the Boric Acid Storage Tanks (BAST) to the Refueling Water Storage Tank (RWST). Then when SRAS is observed to actuate, the examinee verifies the proper SRAS actuation has occurred. The alternate path occurs when one Low Pressure Safety Injection (LPSI) pump does not turn off, as required. The examinee then takes action to attempt to stop the pump with its handswitch, then when that is not successful, carries out Contingency Actions to reposition LPSI injection valves.

S3 Forcing Pressurizer Spray – Alternate Path (Modified JPM-223)
Examinee will Force Pressurizer Sprays. While performing this evolution a Pressurizer Spray valve will fail partially open. The examinee will perform Immediate Operator Actions to observe Pressurizer pressure safety channels and attempt to manually close the spray valve. When the Pressurizer Spray valve does not close the examinee will take Alternate Path (Contingency Action) to place the Pressurizer Spray valve(s) "Normal/Close" switch to close. This will close the Spray Valve. The "Normal/Close" switch is a new modification to the plant, completed during the last refuel outage, and the Immediate Operator Actions procedure was changed to reflect this modification.

S4 Pumping the Containment Sump – Alternate Path (Bank JPM-211)
Examinee pumps the Containment sump until the receipt of the "CTMT NORM SUMP DIS PRESS HI" annunciator is received. The examinee will observe the annunciator alarm and refer to the Alarm Response Procedure (ARP). The ARP directs that the Containment Sump pump be stopped and the examinee stops the pump. When the pump is stopped one of the discharge isolation valves does not close and the examinee identifies this and attempts to close the valve.

S5 Respond to an Open Phase Condition (OPC) – Alternate Path (New)
This is a new JPM for a recent modification to the plant which includes changes to the Standard Post Trip Actions procedure. The examinee will respond to a plant trip and identify an OPC exists and take action to divorce from the electrical source with the OPC and align to a good electrical source.

S6 Power Range Safety Channel and Delta T Power Channel Calibration (Bank JPM-173)
Examinee will performance a portion of a Reactor Protection System (RPS) calibration using procedure SP 2601D, Power Range Safety Channel and Delta T Power Channel Calibration. The examinee will determine that the +10 Volt power Supply voltage is not in the acceptable range and bypass the channel.

S7 Respond to the Loss of a 2nd Circulating Water Pump – Alternate Path (Bank JPM S8)
Examinee will be directed to perform actions in response to a loss of a Circulating Water pump. They will perform actions to cross-tie Circulating System Waterboxes. Once the Waterboxes have been cross-tied the examinee will identify a second Circulating Pump trip in the same Condenser, and either recommend tripping the plant or trip the plant.

S8 Verify Control Room Air Conditioning System in Recirculation in Response to Radiation on RM 9799A/B - (Modified JPM-232)
The examinee will verify the CRACS system has shifted from the recirculation mode after radiation is detected in the Control Room, on radiation monitors RM 9799A/B. A failure on the operating facility will require the examinee to start equipment on one facility and stop equipment on the other facility, to place one complete facility in the recirculation mode, to protect Control Room personnel.

P1 Shift CAR RBCCW Valve to Local Manual – (Bank JPM-245)
Examinee will simulate placing a Containment Air Recirculation (CAR) fan valve in manual and opening it. The task involves isolating air, aligning the manual operator shaft to the valve stem, engaging the lever arm in the manual shaft, and opening the valve. The valve is in the RCA.

P2 Shift AFW Pump Suction to Firewater – (Bank JPM-040A/B)
Examinee will simulate aligning Fire Water to an Auxiliary Feedwater pump. This requires the examinee to open valves from the Firewater System and close a valve from the Condensate Storage Tank. The valves are located in the Turbine Building.

P3 Transferring Computer UPS 480 VAC Main Power Supply - (Bank JPM-116)
Examinee will transfer the Plant Process Computer UPS main power supply from one Vital Facility to the other. This requires checking the main 480 VAC breaker closed, checking UPS switches, operating computer power safety switches, and checking the UPS Inverter operating properly by verifying Inverter indications. The bulk of this JPM is performed in the DC switchgear rooms with a breaker check in the Control Room Air Conditioning equipment room.

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: Millstone Unit 2 Date of Examination: 09/12/2022

Operating Test Number: ES22L1

Examination Level: ☐ RO ☐ SRO-I ☒ SRO-U

System/JPM Title	Type Code	Safety Function
Control Room Systems		
a. S1 Emergency Boration - Alternate Path (K/A 004 A2.14, RO IR 4.0)	A,D,L,S	1
b. S2 LPSI Pump Failure to Trip Post SRAS – Alternate Path (K/A 006 A3.02, RO IR 4.2)	A,D,EN,L,S	2
c. S3 Forcing Pressurizer Spray – Alternate Path (K/A 010 A2.02, RO IR 4.5)	A,M,S	3
d. S4 Pumping the Containment Sump – Alternate Path (K/A 103 A3.01, RO IR 4.2)	A,D,S	5
e. S5 Respond to an Open Phase Condition (OPC) – Alternate Path (K/A 062 A2.16, RO IR 3.7)	A,L,N,S	6
f. S6 Power Range Safety Channel and Delta T Power Channel Calibration (K/A 012 A4.02, RO IR 3.8)	D,S	7
g. S7 Respond to the Loss of a 2nd Circulating Water Pump – Alternate Path (K/A 075 A2.02, RO IR 3.9)	A,D,S	8
h. S8 Verify Control Room Air Conditioning System in Recirculation In Response to Radiation on RM 9799A/B (K/A 050 A4.01, RO IR 3.8)	M,S	9
In-Plant Systems		
i. P1 Shift CAR RBCCW Valve to Local Manual (K/A 022 A4.04, RO IR 3.5)	D,E,L,R	5
j. P2 Shift AFW Pump Suction to Firewater (K/A 061 K1.07, RO IR 4.2)	D,E,L	4
k. P3 Transferring Computer UPS 480 VAC Main Power Supply (K/A 062 A1.03, RO IR 3.5)	D	6

1. Determine the number of control room system and in-plant system job performance measures (JPMs) to develop using the following table:

License Level	Control Room	In-Plant	Total
Reactor Operator (RO)	8	3	11
Senior Reactor Operator-Instant (SRO-I)	7	3	10
Senior Reactor Operator-Upgrade (SRO-U)	2 or 3	3 or 2	5

2. Select safety functions and systems for each JPM as follows:

   Refer to Section 1.9 of the applicable knowledge and abilities (K/A) catalog for the plant systems organized by safety function. For pressurized-water reactor operating tests, the primary and secondary systems listed under Safety Function 4, "Heat Removal from Reactor Core," in Section 1.9 of the applicable K/A catalog, may be treated as separate safety functions (i.e., two systems, one primary and one secondary, may be selected from Safety Function 4). From the safety function groupings identified in the K/A catalog, select the appropriate number of plant systems by safety functions to be evaluated based on the applicant's license level (see the table in step 1).

   For RO/SRO-I applicants: Each of the control room system JPMs and, separately, each of the in-plant system JPMs must evaluate a different safety function, and the same system or evolution cannot be used to evaluate more than one safety function in each location. One of the control room system JPMs must be an engineered safety feature.

   For SRO-U applicants: Evaluate SRO-U applicants on five different safety functions. One of the control room system JPMs must be an engineered safety feature, and the same system or evolution cannot be used to evaluate more than one safety function.

3. Select a task for each JPM that supports, either directly or indirectly and in a meaningful way, the successful fulfillment of the associated safety function. Select the task from the applicable K/A catalog (K/As for plant systems or emergency and abnormal plant evolutions) or the facility licensee's site-specific task list. If this task has an associated K/A, the K/A should have an importance rating of at least 2.5 in the RO column. K/As that have importance ratings of less than 2.5 may be used if justified based on plant priorities; inform the NRC chief examiner if selecting K/As with an importance rating less than 2.5. The selected tasks must be different from the events and evolutions conducted during the simulator operating test and tasks tested on the written examination. A task that is similar to a simulator scenario event may be acceptable if the actions required to complete the task are significantly different from those required in response to the scenario event.

   Apply the following specific task selection criteria:

- At least one of the tasks shall be related to a shutdown or low-power condition.
- Four to six of the tasks for RO and SRO-I applicants shall require execution of alternative paths within the facility licensee's operating procedures. Two to three of the tasks for SRO-U applicants shall require execution of alternative paths within the facility licensee's operating procedures.
- At least one alternate path JPM must be new or modified from the bank.
- At least one of the tasks conducted in the plant shall evaluate the applicant's ability to implement actions required during an emergency or abnormal condition.
- At least one of the tasks conducted in the plant shall require the applicant to enter the radiologically controlled area. This provides an excellent opportunity for the applicant to discuss or demonstrate radiation control administrative subjects.

If it is not possible to develop or locate a suitable task for a selected system, return to step 2 and select a different system.

4. For each JPM, specify the codes for type, source, and location:

Code	License Level Criteria		
	RO	**SRO-I**	**SRO-U**
(A)lternate path	4–6	4–6	2–3
(C)ontrol room			
(D)irect from bank	≤ 9	≤ 8	≤ 4
(E)mergency or abnormal in-plant	≥ 1	≥ 1	≥ 1
(EN)gineered safety feature (for control room system)	≥ 1	≥ 1	≥ 1
(L)ow power/shutdown	≥ 1	≥ 1	≥ 1
(N)ew or (M)odified from bank (must apply to at least one alternate path JPM)	≥ 2	≥ 2	≥ 1
(P)revious two exams (randomly selected)	≤ 3	≤ 3	≤ 2
(R)adiologically controlled area	≥ 1	≥ 1	≥ 1
(S)imulator			

S1 Emergency Boration – Alternate Path (Bank JPM-257)
Examinee observes the Reactor has tripped and commences Standard Post Trip Actions in accordance with EOP 2525. The examinee will observe and report (2) CEAs have not inserted and perform steps to Emergency Borate in accordance with EOP 2541, Appendix 3. The alternate path occurs after all action steps are completed and a check that Charging flow is greater than 40 gpm is being performed. The examinee will observe Charging flow is less than 40 gpm and take Contingency Actions (alternate path) to start an additional Charging pump to achieve greater than 40 gpm Charging flow.

S2 Respond to LPSI Pump Failure to Trip on SRAS Actuation – Alternate Path (Bank JPM-230)
Examinee will perform actions in the LOCA EOP associated with a Sump Recirculation Actuation Signal (SRAS). The examinee takes actions to realign the Charging pumps from the Boric Acid Storage Tanks (BAST) to the Refueling Water Storage Tank (RWST). Then when SRAS is observed to actuate, the examinee verifies the proper SRAS actuation has occurred. The alternate path occurs when one Low Pressure Safety Injection (LPSI) pump does not turn off, as required. The examinee then takes action to attempt to stop the pump with its handswitch, then when that is not successful, carries out Contingency Actions to reposition LPSI injection valves.

S3 Forcing Pressurizer Spray – Alternate Path (Modified JPM-223)
Examinee will Force Pressurizer Sprays. While performing this evolution a Pressurizer Spray valve will fail partially open. The examinee will perform Immediate Operator Actions to observe Pressurizer pressure safety channels and attempt to manually close the spray valve. When the Pressurizer Spray valve does not close the examinee will take Alternate Path (Contingency Action) to place the Pressurizer Spray valve(s) "Normal/Close" switch to close. This will close the Spray Valve. The "Normal/Close" switch is a new modification to the plant, completed during the last refuel outage, and the Immediate Operator Actions procedure was changed to reflect this modification.

S4 Pumping the Containment Sump – Alternate Path (Bank JPM-211)
Examinee pumps the Containment sump until the receipt of the "CTMT NORM SUMP DIS PRESS HI" annunciator is received. The examinee will observe the annunciator alarm and refer to the Alarm Response Procedure (ARP). The ARP directs that the Containment Sump pump be stopped and the examinee stops the pump. When the pump is stopped one of the discharge isolation valves does not close and the examinee identifies this and attempts to close the valve.

S5 Respond to an Open Phase Condition (OPC) – Alternate Path (New)
This is a new JPM for a recent modification to the plant which includes changes to the Standard Post Trip Actions procedure. The examinee will respond to a plant trip and identify an OPC exists and take action to divorce from the electrical source with the OPC and align to a good electrical source.

S6 Power Range Safety Channel and Delta T Power Channel Calibration (Bank JPM-173)
Examinee will performance a portion of a Reactor Protection System (RPS) calibration using procedure SP 2601D, Power Range Safety Channel and Delta T Power Channel Calibration. The examinee will determine that the +10 Volt power Supply voltage is not in the acceptable range and bypass the channel.

S7 Respond to the Loss of a 2nd Circulating Water Pump – Alternate Path (Bank JPM S8)
Examinee will be directed to perform actions in response to a loss of a Circulating Water pump. They will perform actions to cross-tie Circulating System Waterboxes. Once the Waterboxes have been cross-tied the examinee will identify a second Circulating Pump trip in the same Condenser, and either recommend tripping the plant or trip the plant.

S8 Verify Control Room Air Conditioning System in Recirculation in Response to Radiation on RM 9799A/B - (Modified JPM-232)
The examinee will verify the CRACS system has shifted from the recirculation mode after radiation is detected in the Control Room, on radiation monitors RM 9799A/B. A failure on the operating facility will require the examinee to start equipment on one facility and stop equipment on the other facility, to place one complete facility in the recirculation mode, to protect Control Room personnel.

P1 Shift CAR RBCCW Valve to Local Manual – (Bank JPM-245)
Examinee will simulate placing a Containment Air Recirculation (CAR) fan valve in manual and opening it. The task involves isolating air, aligning the manual operator shaft to the valve stem, engaging the lever arm in the manual shaft, and opening the valve. The valve is in the RCA.

P2 Shift AFW Pump Suction to Firewater – (Bank JPM-040A/B)
Examinee will simulate aligning Fire Water to an Auxiliary Feedwater pump. This requires the examinee to open valves from the Firewater System and close a valve from the Condensate Storage Tank. The valves are located in the Turbine Building.

P3 Transferring Computer UPS 480 VAC Main Power Supply - (Bank JPM-116)
Examinee will transfer the Plant Process Computer UPS main power supply from one Vital Facility to the other. This requires checking the main 480 VAC breaker closed, checking UPS switches, operating computer power safety switches, and checking the UPS Inverter operating properly by verifying Inverter indications. The bulk of this JPM is performed in the DC switchgear rooms with a breaker check in the Control Room Air Conditioning equipment room.

SIMULATOR SCENARIO #1

Form 3.3-1 Scenario Outline

Facility:	Millstone Unit 2	Scenario #:	1
Scenario Source:	New	Op. Test #:	ES22LI1
Examiners:		Applicants/	
		Operators:	

Initial Conditions: 100% power, steady state operations, 'A' Train protected.

Turnover: No equipment out of service. Perform SP 2606D, 2-CS-4.1B Valve Tests, Facility 2.

Critical Tasks: (see page 5)

1. Manually shutdown the Turbine on the reactor trip prior to proceeding to Maintenance of Vital Auxiliaries Safety Function
2. Commence a plant cool down within 60 minutes of the onset of a LOCA.
3. Secure Reactor Coolant pumps within 10 minutes of losing NPSH

Event No.	Malf. No.	Event Type*	Event Description
1	RH15B	N - ATC/US TS - US	Stroke 'B' CTMT Spray MOV. Valve fails to stroke fully closed.
2	05A1A3S1 C06-B16	C – BOP/US	Containment Penetration Cooling fan trips.
3	RC04	C – ATC/US TS – US	RCS Leak
4	N/A	R - All	Rapid Downpower
5	RC03A	M – All	SB-LOCA (TRIP CRITERIA)
6	TC10H	C – BOP/US MC - BOP	Main Turbine fail to trip → Manually trip turbine
7	RC06B	C – ATC/US MC - ATC	2-RC-404, #2 PORV, fails open

* (N)Normal, (R)Reactivity, (I)Instrument, (C)Component, (M)Major, (TS)Tech Spec, (MC)Manual Control

Quantitative Attribute	Target per Scenario	Actual
Events after EOP entry	1–2	2
Abnormal events	2–4	5
Major transients	1–2	1
EOPs entered/requiring substantive actions	1–2	1
Entry into a contingency EOP with substantive actions	1 per scenario set	0
Preidentified CTs	2 or more	3

Scenario Summary:

The crew will take the shift with the unit at 100% power, steady state, no equipment OOS (IC-21).

Event 1: The ATC performs SP 2606D, 2-CS-4.1B Valve Tests, Facility 2. The valve does not stroke completely. The US enters TSAS 3.6.3.1 (CTMT Isolation Valves) and 3.6.2.1a (CTMT Spray Train).

Event 2: F-37A, 'A' Containment Penetration Fan, trips. ARP 2590E-078, CTMT PENT CLG FAN OVERLOAD/TRIP, directs the US to OP 2314C, Containment Penetration Cooling. F-37B is started.

Event 3: The plant experiences a RCS leak. The crew enters AOP 2568, Reactor Coolant System Leak. The leak rate is determined to be greater than TS allowable. The US enters TS 3.4.6.2. The leak is determined to be not isolable.

Event 4: The crew enters AOP 2575, Rapid Downpower, and commences a down power to take the plant off-line.

Event 5: The RCS leak worsens to greater than the capacity of the Charging system. The plant is tripped, the 60-minute time to commence a cooldown is started. A LOCA is diagnosed and EOP 2532, Loss of Coolant Accident, is entered.

Event 6: On the trip, the Main Turbine does not trip. The BOP takes actions to emergency trip the turbine.

Event 7: On the trip, the #2 PORV, 2-RC-404, fails open. The ATC takes action to close the PORV.

The scenario will end at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Number	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
TC10H	TURB TRIP FAIL(RX TRIP)	-	-	-	-	-	-
RH15	MECHICAL BINDING OF CS4.1B IN THE MID-POSITION	-	-	17	-	-	1
C06-B16	CTMT PENT CLG FAN OVERLOAD/TRIP (**PIN to desktop)**	-	-	2	ON	ON	2
RC04	RX HEAD VENT LEAK	-	-	4	15	15	4
RC03A	RCS COLD LEG LOOP 1A BRK	-	-	6	10	10	5
RC06B	PORV (RC-404) FAIL			30	100	100	6
REMOTE FUNCTIONS							
OVERRIDES							
05A1A3S1	CTMT PNTRTION FAN	-	-	2	STOP	STOP	2
EVENT FILES							
ES22LI1	Simulator Scenario Event File (needed for trigger 17)						

Critical Task Elements

Critical Task Statement	Manually shutdown the turbine.
Initiating Cue	EOP 2525, Standard Post Trip Actions, step 2. Reactivity Control – Turbine Trip
Performance Feedback	Main Turbine Control valves and Stop valves go closed, turbine speed starts lowering and switchyard breakers 15G-9T-8T & 9T open.
Success Path	The Main Turbine is tripped by pushing the Emergency Trip push buttons on C-07.
Measurable Performance Standard	The operator is observed to simultaneously push both Main Turbine 'MASTER TRIP/EMERGENCY TRIP" push buttons prior to the US addressing the Maintenance of Vital Auxiliaries safety function.

Critical Task Statement	Secure all RCPs within 10 minutes of losing NPSH
Initiating Cue	RCS Pressure drops below the operating limit of the Reactor Coolant Pumps
Performance Feedback	The RCPs are secured, causing Hot leg temperatures to increase as natural circulation heat removal is established. Steam dumps/ADVs throttle open to maintain T_{AVE}/S/G pressure.
Success Path	Opening the RCP breakers.
Measurable Performance Standard	The operator secures ALL reactor Coolant pumps within 10 minutes of the pump's not meeting their NPSH requirements as seen on MON1 or determined by EOP 2541, Appendix 2, Fig. 2, RCP NPSH curve.

Critical Task Statement	Perform a plant cooldown.
Initiating Cue	EOP 2532, Loss of Coolant Accident, step 19. Perform Controlled Cooldown
Performance Feedback	A cooldown of RCS temperatures, within Technical Specification limits (< 100˚F/hour), should be observed. Note that the temperature change limits are for a continuous 1 hour period.
Success Path	The plant cooldown is performed by operating either the Atmospheric Dump Valves or the Condenser Steam Dump valves.
Measurable Performance Standard	The operator is observed to commence a plant cooldown no later than one hour after an un-isolable LOCA occurs.

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: **1** Page **6** of **24**

Event Description: Perform 2606D-004, 2-CS-4.1B Stroke IST, Facility 2

Symptoms/Cues: Valve does not stroke closed (dual indication)

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td>ATC</td><td>OPEN CS-4.1B, 'CS HDR B ISOL' (C-01)</td></tr>
<tr><td colspan="3">Booth Operator: AFTER CS-4.1B is open, Insert Trigger #17
• RH15, MECHICAL BINDING OF CS4.1B IN THE MID-POSITION</td></tr>
<tr><td></td><td>ATC</td><td>CLOSE CS-4.1B, 'CS HDR B ISOL' (C-01)
• Notify US that CS-4.1B did not stroke closed
• Procedure directs operator to Go To Attachment 1, Actions for IST Data Outside "Acceptable" Limits</td></tr>
<tr><td colspan="3">Examiner note: Examinee may choose either ACTION a, b, or c.</td></tr>
<tr><td></td><td>US</td><td>LCO 3.6.3.1 CONTAINMENT ISOLATION VALVES
Each containment isolation valve shall be OPERABLE. (1)(2)
<u>Applicability:</u> MODES 1, 2, 3, and 4.
<u>ACTION:</u> With one or more of the isolation valve(s) inoperable, either:
a. Restore the inoperable valve(s) to OPERABLE status within 4 hours, or
b. Isolate the affected penetration(s) within 4 hours by use of a deactivated automatic valve(s) secured in the isolation position(s), or
c. Isolate the affected penetration(s) within 4 hours by use of a closed manual valve(s) or blind flange(s); or
d. Isolate the affected penetration that has only one containment isolation valve and a closed system within 72 hours by use of at least one closed and deactivated automatic valve, closed manual valve, or blind flange: or
e. Be in COLD SHUTDOWN within the next 36 hours.
(1) Containment Isolation Valves may be opened on intermittent basis under administrative controls
(2) The provisions of this specification in MODES 1, 2 and 3, are not applicable for main steam isolation valves. However, provisions of Specification 3.7.1.5 are applicable for main steam isolation valves.</td></tr>
<tr><td></td><td>US</td><td>LCO 3.6.2.1.a CONTAINMENT SPRAY AND COOLING SYSTEMS
Two containment spray trains and two containment cooling trains, with each cooling train consisting of two containment air recirculation and cooling units, shall be OPERABLE.
<u>Applicability:</u> MODES 1, 2 and 3*.
<u>ACTION:</u>
<table>
<tr><th>Inoperable equipment</th><th>Required ACTION</th></tr>
<tr><td>a. One containment spray train</td><td>a.1 Restore the inoperable containment spray train to OPERABLE status within 72 hours or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following 6 hours.</td></tr>
</table>
* The Containment Spray System is not required to be OPERABLE in MODE 3 if pressurizer pressure is < 1750 psia.</td></tr>
<tr><td colspan="3">When the event has been addressed to the lead examiner's satisfaction, proceed to the next event</td></tr>
</table>

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: **2** Page **7** of **24**

Event Description: F-37A, 'A' CTMT Penetration Cooling fan trips.

Symptoms/Cues: The following alarm is received coincident with F-37's green light lit and red light extinguished:

- CTMT PENT CLG FAN OVERLOAD/TRIP (B-16, C-06/7)

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger #**2** • C06-B16, CTMT PENT CLG FAN OVERLOAD/TRIP • 05A1A3S1, CTMT PNTRTION FAN (OFF) **PIN** malfunction C06-B16, CTMT PENT CLG FAN OVERLOAD/TRIP to desktop. **WHEN** F-37A handswitch is placed in **OFF**, **REMOVE** malfunction C06-B16, CTMT PENT CLG FAN OVERLOAD/TRIP		
	US	References the following ARP: • ARP 2590E-078, CTMT PENT CLG FAN OVERLOAD/TRIP T (CB-19, C-06/7 Directs BOP to OP 2314E, Containment Penetration Cooling System, to start standby fan.
	BOP	Places F-37B, CTMT PENT COOL SPLY FAN, to START Verifies HV-60, DIS DMPR, opens
When the event has been addressed to the lead examiner's satisfaction, proceed to the next event		

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: 3

Event Description: 15 gpm RCS Leak

Symptoms/Cues: Lowering Pressurizer level, lowering Letdown flow, rising CTMT level, and alarms:

- Pressure increase on PI-8117, CTMT PRES-LR (CTMT narrow range pressure)
- CTMT NORM SUMP LEVEL HI/LO (C-06/7, BA21)
- Increase in CTMT particulate and gaseous RMs (8123A/B, 8262 A/B)

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger **#4** • RC04, RX HEAD VENT LEAK (15 gpm)		
Examiner Note: Crew identifies RCS leak and enters AOP 2568, RCS Leak		
	US	CONTINUOUS ACTION PAGE (Plant trip criteria) 1. <u>PRESSURIZER LEVEL LOWERING WITH SECOND CHARGING PUMP RUNNING</u> • IF in MODE 1 OR MODE 2, THEN TRIP Reactor AND GO TO EOP 2525, Standard Post Trip Actions
	ATC	NOTE: Foldout page shall be monitored throughout this procedure. 1. Monitor Loss of RCS Inventory a. CHECK Pressurizer Level - LOWERING b. ADJUST LTDN FLOW CNTL, HIC-110, to stabilize Pressurizer level c. CHECK Pressurizer level continuing to lower d. START second Charging Pump e. ADJUST LTDN FLOW CNTL, HIC-110, to stabilize Pressurizer level f. CHECK Pressurizer level STABLE or RISING g. INITIATE Forcing Pressurizer Sprays
	ATC US	2. Observe Reactor Power and RCS Temperature a. CHECK Reactor Power – STABLE b. CHECK RCS temperature – STABLE NOTE: Pumping the Containment Sump with an RCS leak should be avoided. NOTE: ATTACHMENT B, Thumbrules, provides various tank fill rates. NOTE: Stable Pressurizer level supports an accurate leak rate determination.
	US ATC BOP	3. Determine RCS Leak Rate by any of the Following: • ACCOUNT for RCP Bleedoff flow <u>AND</u> CALCULATE the difference in Charging and Letdown flow • REFER to ATTACHMENT B, Thumbrules, <u>AND</u> DETERMINE RCS leak rate • OBTAIN SPDS Sump leak rate

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: 3

Event Description: 15 gpm RCS Leak

Symptoms/Cues: Lowering Pressurizer level, lowering Letdown flow, rising CTMT level, and alarms:

- Pressure increase on PI-8117, CTMT PRES-LR (CTMT narrow range pressure)
- CTMT NORM SUMP LEVEL HI/LO (C-06/7, BA21)
- Increase in CTMT particulate and gaseous RMs (8123A/B, 8262 A/B)

	US	4. CHECK RCS Leakage Within The Following Limits Of T/S LCO 3.4.6.2, Reactor Coolant System Operational Leakage: • NO Pressure Boundary Leakage • LESS THAN or EQUAL TO 1 gpm Unidentified Leakage • LESS THAN or EQUAL TO 10 gpm Identified Leakage • LESS THAN or EQUAL TO 75 gpd Primary to Secondary Leakage through any one steam generator **RESPONSE NOT OBTAINED** PERFORM the following: 1. USE the following documents to determine reporting requirements, while continuing with this procedure: • MP-26-EPI-FAP06, Classification and PARs • RAC 14, Non-Emergency Station Events 2. REFER to T/S LCO 3.4.6.2, Reactor Coolant System Operational Leakage. IF Containment Sump level indication is off scale, THEN REFER to T/S LCOs 3.4.6.1b, Leakage Detection Systems, and 3.3.3.8, Accident Monitoring AND PERFORM applicable actions.
	US	LCO 3.4.6.2 RCS LEAKAGE Reactor Coolant System Operational LEAKAGE shall be limited to: a. No PRESSURE BOUNDARY LEAKAGE, b. 1 GPM UNIDENTIFIED LEAKAGE, c. 75 GPD primary to secondary LEAKAGE through any one S/G, and d. 10 GPM IDENTIFIED LEAKAGE. APPLICABILITY: MODES 1, 2, 3 and 4. ACTION: a. With any RCS operational LEAKAGE not within limits for reasons other than PRESSURE BOUNDARY LEAKAGE or primary to secondary LEAKAGE, reduce LEAKAGE to within limits within 4 hours. b. With ACTION and associated completion time of ACTION a. not met, or PRESSURE BOUNDARY LEAKAGE exists, or primary to secondary LEAKAGE not within limits, be in HOT STANDBY within 6 hours and be in COLD SHUTDOWN within 36 hours.

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: 3

Event Description: 15 gpm RCS Leak

Symptoms/Cues: Lowering Pressurizer level, lowering Letdown flow, rising CTMT level, and alarms:

- Pressure increase on PI-8117, CTMT PRES-LR (CTMT narrow range pressure)
- CTMT NORM SUMP LEVEL HI/LO (C-06/7, BA21)
- Increase in CTMT particulate and gaseous RMs (8123A/B, 8262 A/B)

<table>
<tr><td></td><td>US</td><td>LCO 3.3.3.8 ACCIDENT MONITORING:
The accident monitoring instrumentation channels shown in Table 3.3-11 shall be OPERABLE.
APPLICABILITY: MODES 1, 2 and 3.
ACTION:
a. ACTIONS per Table 3.3-11.
<table><tr><td colspan="4">Table 3.3-11, ACCIDENT MONITORING INSTRUMENTATION</td></tr><tr><td>Instrument</td><td>Total # Channels</td><td>Minimum Channels OPERABLE</td><td>ACTION</td></tr><tr><td>8. Containment Water Level (Narrow Range)</td><td>1</td><td>1</td><td>7##</td></tr></table>## Refer to ACTION statement in Technical Specification 3.4.6.1.
ACTION 7; Restore the inoperable system to OPERABLE status within 7 days or be in COLD SHUTDOWN within the next 36 hours. (See the ACTION statement in Technical Specification 3.4.6.1.).</td></tr>
<tr><td></td><td>US</td><td>LCO 3.4.6.1 LEAKAGE DETECTION SYSTEM:
The following Reactor Coolant System leakage detection systems shall be OPERABLE:
a. One of two containment atmosphere particulate radioactivity monitoring channels, and
b. The containment sump level monitoring system.
APPLICABILITY: MODES 1, 2, 3 and 4.
ACTION:
b. With the containment sump level monitoring system inoperable, operation may continue for up to 30 days provided:
1. A Reactor Coolant System water inventory balance is performed at least once per 24 hours during steady state operation. Otherwise, be in COLD SHUTDOWN within the next 36 hours.</td></tr>
<tr><td></td><td>ATC</td><td>MAINTAIN VCT Level 72 to 86%</td></tr>
<tr><td></td><td>US</td><td>6. Evaluate Activities That Could Impact RCS Integrity
a. CHECK activities that could affect primary plant leakage - NONE IN PROGRESS
• Valve alignment
• Periodic Testing
• Maintenance</td></tr>
</table>

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: 3

Event Description: 15 gpm RCS Leak

Symptoms/Cues: Lowering Pressurizer level, lowering Letdown flow, rising CTMT level, and alarms:

- Pressure increase on PI-8117, CTMT PRES-LR (CTMT narrow range pressure)
- CTMT NORM SUMP LEVEL HI/LO (C-06/7, BA21)
- Increase in CTMT particulate and gaseous RMs (8123A/B, 8262 A/B)

	US	7. Identify AND Locate RCS Leak Using Table 1 DETERMINE priority of steps 8 through 16 for leak identification and isolation NOTE: Based on priorities determined in step 7, steps 8 through 16 may be performed in any order. At US discretion, only steps applicable to the observed leak in progress need to be performed. NOTE: ATTACHMENT E, Potential RCS Leak Isolations, provides a listing of valves that may be used to isolate leakage from the RCS a. PERFORM steps 8 through 16 in any order and as required to identify and isolate RCS leak b. PROCEED TO step 17.
	US	9. Evaluate Containment For RCS Leakage a. CHECK all of the following conditions - MET: • Containment Sump level rate of rise - NORMAL (C-07) • Containment Radiation Monitor readings - NORMAL (RC-14/PPC) • Containment Temperature and Pressure - NORMAL (C-01/PPC)
	US	9. **RESPONSE NOT OBTAINED** a. PERFORM the following: 1. ENSURE RCS Sample valves - CLOSED (C-01X/PPC/C-72): • 2-RC-001, RC Hot Leg Isol • 2-RC-002, PZR Surge Sample Isol • 2-RC-003, PZR Stm Sample Isol • 2-RC-45, RC Combined Sample Isol Valve 2. NOTIFY OMOC of the potential need for Containment entry for leak identification. 3. REQUEST Work Week Coordinator PREPARE for Containment Entry using C OP 200.14, Containment Entry. 4. USE ATTACHMENT E, Potential RCS Leak Isolations, to address leakage into Containment. a. IF leakage into Containment is indicated WITHOUT a resulting loss of RCS inventory, THEN CONSIDER other system leakage. 5. PROCEED TO step 10.

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: 3

Event Description: 15 gpm RCS Leak

Symptoms/Cues: Lowering Pressurizer level, lowering Letdown flow, rising CTMT level, and alarms:

- Pressure increase on PI-8117, CTMT PRES-LR (CTMT narrow range pressure)
- CTMT NORM SUMP LEVEL HI/LO (C-06/7, BA21)
- Increase in CTMT particulate and gaseous RMs (8123A/B, 8262 A/B)

Examiner note: There is no need to proceed through the other RCS Leak identification steps. The US should proceed to step 17.		
	US	17. Evaluate RCS Leakage a. CHECK RCS leakage has been reduced to within Tech Spec 3.4.6.2 limits 17. **RESPONSE NOT OBTAINED** a. PERFORM one of the following to place the plant in MODE 5 within the time constraints of TS 3.4.6.2: • GO TO AOP 2575, Rapid Downpower. OR • GO TO OP 2207, Plant Cooldown.
	CREW	Transitions to AOP 2575, Rapid Downpower

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: 4

Event Description: Rapid Downpower

Symptoms/Cues: Directed from AOP 2568, RCS Leak, step 17

Time	Position	Applicant's Actions or Behavior
Examiner Note: AOP 2575, Rapid Downpower, is entered.		
	US	1. Perform notifications
	ATC	2. Initiate forcing sprays • Places all B/U heaters to 'ON' • Adjusts PRES CNTL-Y, PIC 100Y thumbwheel to achieve 50% output
	ATC BOP	3. Insert Group 7 CEAs 10 steps (8 – 12 steps in procedure) Lower Turbine Load (LOAD SPEED CONTROL switch), maintain T_{COLD} ± 2°F of program.
	US	4. Determine Reactivity Plan Availability → Borate from RWST using 2 Charging Pumps
	BOP	5. Reduce turbine load **AND** Maintain T_{COLD} within 2 °F of program 1) Set up Turbine controls (Attachment G) • Select 'Load Setpt' and enter desired value → 14%. • Select 'Rate Setpt' and enter desired value → 30%/hour 2) Reduce turbine load when effects of boron are seen (After step 7 is complete). • When ready to commence load reduction, then select 'Load Resume'. • IF Turbine Load Ramp Rate needs adjustment, perform any of the following: ○ SELECT 'Rate Setpt' AND ENTER new value. ○ SELECT one of the following: 5%, 10%, or 20% per hour ○ SELECT Raise or Lower (0.25% / hour change).
	ATC	6. Raise Charging Flow – No actions taken, both charging pumps running from Event #4
	ATC	7. Borate from the RWST a. CHECK Boration from RWST - SELECTED b. CHECK VCT MAKEUP BYPASS, CH-196 - CLOSED c. CHECK RWST TO CHG SUCT, CH-504 - OPEN d. OPEN RWST ISOL, CH-192 e. CLOSE VCT OUT ISOL, CH-501 8. N/A - Borate from the BAST
	ATC	9. Maintain VCT parameters • Level 70 – 90% • Pressure < 30 psig 10. N/A – Temporary Suspension of Boration
	CREW	11. Maintain parameters as specified in Attachment A
AFTER the BOP has seen the effects of the boration and commenced turbine load reduction **AND** the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: **5** Page **14** of **24**

Event Description: LOCA, Reactor trip, EOP 2525, Standard Post Trip Actions

Symptoms/Cues: RCS Leakage exceeds the capacity of the Charging Pumps, pressurizer level lowers, Letdown lowers to limiter (28gpm), CTMT pressure increasing.

Time	Position	Applicant's Actions or Behavior
Booth Operator: **WHEN** directed by Lead Examiner, **INSERT** Trigger #6 • RCO3A, RCS Cold Leg Loop 1A Break (10)		
	ATC	Reactivity Control - Reactor Trip 1. Ensure Reactor Trip by ALL of the following: • ALL CEAs fully inserted • Reactor power is dropping • SUR is negative
Examiner Note: Mark START TIME of LOCA :_____.		
Critical Task: Manually shutdown the Turbine on the reactor trip prior to proceeding to Maintenance of Vital Auxiliaries Safety Function		
	BOP	Reactivity Control -Turbine Trip 2. Ensure Turbine trip by ALL of the following: a. CHECK main turbine is tripped by ALL the following conditions: ▪ ALL main stop valves OR ALL control valves are closed **RESPONSE NOT OBTAINED** a.1 Perform the following: 1) TRIP Turbine 2) If turbine can NOT be tripped, THEN CLOSE MSIVs ▪ Generator Megawatts indicate zero ▪ Turbine speed lowering b. IF 15G-2X1-4, motor operated disconnect is closed, THEN CHECK BOTH Main Generator output breakers 15G-8T-2 and 15G-9T-2 are open
	BOP	Maintenance of Vital Auxiliaries 3. Ensure Maintenance of Vital Auxiliaries is met by ALL of the following conditions: a. CHECK Open Phase Condition annunciator RSST OPEN PHASE (C-06/7, C-48) – NOT LIT. b. CHECK vital and non-vital loads – ENERGIZED. c. CHECK that both facilities of Service Water are operating. d. CHECK that both facilities of RBCCW are operating with Service Water cooling.

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1	Scenario No.: 1	Event No.: **5** Page **15** of **24**

Event Description: LOCA, Reactor trip, EOP 2525, Standard Post Trip Actions

Symptoms/Cues: RCS Leakage exceeds the capacity of the Charging Pumps, pressurizer level lowers, Letdown lowers to limiter (28gpm), CTMT pressure increasing.

	ATC	RCS Inventory Control 4. Ensure RCS Inventory Control met by **ALL** of the following conditions: a. Pressurizer level is between 20 to 80%, trending to 35 to 70%. **RESPONSE NOT OBTAINED** a.1 START the 3rd charging pump **AND** SECURE Letdown b. CHECK RCS subcooling > 30 °F
	ATC	RCS Pressure Control 5. ENSURE RCS Pressure Control met by **BOTH** the following: • CHECK pressurizer pressure is 1900 to 2350 psia, trending to 2225 to 2300 psia. **RESPONSE NOT OBTAINED** 5.1 OPERATE the Pressurizer Pressure Control System. Manually OPERATE pressurizer heaters and spray valves. 5.2 If any spray valve will not close, then stop RCPs as necessary 5.3 If any PORV is open AND pressurizer pressure is less than 2250 psia, THEN close the associated PORV Block valve. 5.4 IF pressurizer pressure is less than 1714, THEN ensure **ALL** the following: • SIAS actuated (C01) • CIAS actuated (C01) • EBFAS actuated (C01) 5.5 IF pressurizer pressure is less than 1714 psia AND SIAS actuated, THEN ENSURE ONE RCP in each loop is stopped. **5.6 TCOA**: IF Pressurizer pressure lowers to less than the minimum of Fig. 2 "RCP NPSH Curve" THEN STOP ALL RCPs
	ATC	Core Heat Removal 6. Ensure Core Heat Removal met by **ALL** of the following conditions: a. CHECK at least **1** RCP is operating, AND loop ΔT < 10 °F **RESPONSE NOT OBTAINED** a.1 IF RCPs are *not* operating, OR loop ΔT is greater than 10°F, THEN PERFORM the following: 1) PLACE TIC-4165, steam dump TAVG controller, in manual and closed. 2) PLACE **BOTH** pressurizer spray valve controllers in manual and CLOSE the valves. • HIC-100E • HIC-100F b. RCS subcooling ≥ 30 °F

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1 Event No.: **5** Page **16** of **24**

Event Description: LOCA, Reactor trip, EOP 2525, Standard Post Trip Actions

Symptoms/Cues: RCS Leakage exceeds the capacity of the Charging Pumps, pressurizer level lowers, Letdown lowers to limiter (28gpm), CTMT pressure increasing.

	BOP	RCS Heat Removal 7. Ensure RCS Heat Removal met by **ALL** of the following conditions: a. At least one S/G has BOTH of the following conditions met: • Level 10% to 80%. • Main feedwater or TCOA**:** TWO auxiliary feedwater pumps operating to restore level between 40% to 70%. b. RCS T_{COLD} is being maintained between 530 °F to 535 °F c. BOTH S/G pressures are 880 to 920 psia.
	ATC	Containment Isolation – met 8. Ensure Containment Isolation met by **ALL** of the following conditions: a. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED – No actions** a.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS actuated. (C01) • CIAS actuated. (C01) • EBFAS actuated. (C01) • MSI actuated. (C01) b. CHECK No primary plant rad monitors have an unexplained rise or are in alarm • RM-7891 has unexplained rise c. CHECK No steam plant rad monitors have an unexpected rise or are in alarm • RM-5099 is in alarm
	ATC	Containment Temperature and Pressure Control – met a. CTMT temperature < 120 °F **RESPONSE NOT OBTAINED** a.1 ENSURE **ALL** available normal cooling and ventilation systems are OPERATING: • CAR fans operating on the facility with an operating train of RBCCW • CTMT Aux Circ fans b. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED** b.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS, CIAS, EBFAS, MSI actuated. (C01) (already done in Containment Isolation , above) 1) Place **ALL** available containment aux circ fans I low speed 2) START **ALL** available containment post incident recirc fans

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1	Scenario No.: 1	Event No.: **5**	Page **17** of **24**

Event Description: LOCA, Reactor trip, EOP 2525, Standard Post Trip Actions

Symptoms/Cues: RCS Leakage exceeds the capacity of the Charging Pumps, pressurizer level lowers, Letdown lowers to limiter (28gpm), CTMT pressure increasing.

		b.2 **IF** containment pressure is greater than or equal to 9.48 psig, THEN ENSURE **ALL** of the following: • CSAS actuated (C01) • **ALL** operating containment spray pumps are delivering at least 1300 gpm each
	ATC/BOP	Perform Appendix 4, Reactor Trip Subsequent Actions
	US	Diagnose the event a. Diagnostic Flowchart directs operator to EOP 2532, Loss of Coolant Accident

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1	Event No.: **8**	Page **18** of **24**
Event Description: EOP 2532, Loss of Coolant Accident		
Symptoms/Cues: Directed by performance of Diagnostic Flowchart		

Time	Position	Applicant's Actions or Behavior
	US	WARNING 1. ALL Personnel are required to use ice vests for all tasks associated with a Loss of Coolant Accident (LOCA) and performed in Unit 2 Aux. Building and or Enclosure Building. 2. Ice vests can be found in Unit One Control Room area. NOTE: Harsh Containment values are designated with brackets [ ]. These values should be used anytime CIAS has actuated on high containment pressure greater than 4.42 psig.
	US BOP	Confirm Diagnosis *1. Monitor the Safety Function Status Checks AND CHECK Safety Function Status Check Acceptance Criteria are satisfied.
		*2. CHECK steam generators sample available: a. CHECK "B" train RBCCW header in operation. b. ENSURE RB-210, SAMPLE/DEGAS EFF CLR ISOL, is open. c. OPEN **BOTH** the steam generator sample valves: • MS- 191A • MS- 191B d. DIRECT Chemistry to Sample **BOTH** steam generators for activity AND boron e. WHEN the samples have been taken, THEN CLOSE **BOTH** steam generator sample valves: • MS- 191A • MS- 191B
	US	Classify the Event *3. **REFER TO** MP-26-EPI-FAP06, "Classification and PARs," AND PERFORM the following: a. CLASSIFY the event b. Using EOP 2541, Appendix 46, Sampling for EAL Determination, DIRECT Chemistry to sample for EAL determination.
	US	Implement Placekeeping *4. PERFORM the following: • OPEN the placekeeper and ENTER the EOP entry time. • ENSURE Alarm Silence Switch is in "NORMAL."

Op. Test No.: ES22LI1 Scenario No.: 1	Event No.: **8**	Page **19** of **24**
Event Description: EOP 2532, Loss of Coolant Accident		
Symptoms/Cues: Directed by performance of Diagnostic Flowchart		

	ATC	SIAS Actuation *5. IF pressurizer pressure is less than 1714 psia, PERFORM ALL of the following: a. CHECK SIAS, CIAS and EBFAS have actuated. (C-01) b. **TCOA** ENSURE at least **ONE** complete facility of CRAC is operating in the recirc mode: (C25A/B) **Facility 1** • HV- 203A, Fan F- 21A exhaust damper is open. • Fan F- 21A, supply fan is running. • HV- 206A, Fan F- 31A exhaust damper is open. • Fan F- 31A, exhaust fan is running. • HV- 212A, Fan F- 32A exhaust damper is open. • Fan F- 32A, filter fan is running. • HV- 202, minimum fresh air damper is closed. • HV- 207, cable vault exhaust damper is closed. • HV- 208, exhaust air damper is closed.
	ATC	Optimize Safety Injection *6. PERFORM ALL of the following actions: a. CHECK at least **ONE** train of SIAS, CIAS and EBFAS actuated. (C-01X) b. ENSURE **ALL** available SI pumps are operating. c. REFER To EOP 2541, Appendix 2, Figures, Fig. 3 AND CHECK that safety injection flow is adequate. d. START **ALL** available charging pumps. e. ENSURE vital switchgear cooling is operating for each operating ECCS train as follows: 'A' TRAIN **Lower 4160V switchgear room** • Fan F- 134, LOWER 4160VAC SWITCHGEAR COOLING FAN, is energized. • SW- 178B, COOLER x-182 CONTROL VALVE, is open. **West 480V switchgear room** • Fan F- 51, WEST 480V SWGR RM COOLING FAN, is running • SW- 178A, COOLERS X-181A, X-181 SW CONTROL VALVE, is open. **East DC switchgear room** • Fan F- 54A, A DC SWGR RM COOLING FAN, is running • P-122A, A Chilled Water pump, is running • X-169A, A Vital chiller, is energized

		'B' TRAIN **Upper 4160V switchgear room** • Fan F- 133, UPPER 4160V SWGR RM COOLING FAN, is energized • SW-178C, COOLER X-183 SW CONTROL VALVE, is open **East 480V switchgear room** • Fan F- 52, EAST 480V SWGR RM COOLING FAN, is energized • Fan F- 142, EAST 480V SWGR RM EXHAUST FAN, is energized **West DC switchgear room** • Fan F- 54B, B DC SWGR RM COOLING FAN, is running • P-122B, B Chilled Water pump, is running • X-169B, B Vital chiller, is energized f. CHECK F-112A OR F-112B, Battery Room Exhaust fan is running (ZE689A or ZE689B)
Critical Task: Secure all RCPs within 10 minutes of losing NPSH (IF PORV BLOCK VALVE CLOSURE DELAYED)		
	ATC	RCP Trip Strategy *7. PERFORM The following actions: a. CHECK BOTH of the following conditions exist: • pressurizer pressure is less than 1714 psia AND • SIAS has actuated b. ENSURE ONE RCP in each loop is stopped. c. PLACE associated pressurizer spray valve controller in MAN AND CLOSE the applicable spray valve: • HIC-100E, spray valve controller, RC- 100E • HIC-100F, spray valve controller, RC- 100F d. **REFER TO** EOP 2541, Appendix 2, Figures, Fig. 2, RCP NPSH Curve, AND CHECK RCP NPSH is within limits. **RESPONSE NOT OBTAINED** (IF PORV BLOCK VALVE CLOSURE DELAYED) d.1 TCOA STOP **ALL** RCPs d.2 PLACE TIC- 4165, steam dump T_{AVG} controller, in M AND closed. d.3 PLACE BOTH spray valve controllers in MAN AND CLOSE the valves: • HIC-100E, spray valve controller, RC- 100E • HIC-100F, spray valve controller, RC- 100F

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1	Event No.: **8**	Page **21** of **24**
Event Description: EOP 2532, Loss of Coolant Accident		
Symptoms/Cues: Directed by performance of Diagnostic Flowchart		

	ATC	RCP Operating Limits *8. PERFORM the following actions: a. CHECK at least ONE RCP operating **RESPONSE NOT OBTAINED** (IF PORV BLOCK VALVE CLOSURE DELAYED) a.1 IF ALL RCPs are stopped, THEN PERFORM the following: 1) PLACE BOTH spray valve controllers in MAN AND CLOSE the valves: • HIC-100E, spray valve controller, RC- 100E • HIC-100F, spray valve controller, RC- 100F 2) PLACE TIC- 4165, steam dump T_{AVG} controller, in M AND closed. a.2 PROCEED TO step 9 b. REFER TO EOP 2541, Appendix 22, RCP Operating Parameters, AND CHECK RCP limits satisfied
	ATC	Isolate the LOCA *9. ISOLATE potential LOCA locations as follows: a. CHECK BOTH PORVs closed. • RC-402 • RC-404 b. ENSURE BOTH of the following letdown isolation valves are closed: • CH-515 • CH-516 c. CHECK ALL of the following RCS sample line isolation valves are closed: Facility 1 • RC- 45, RC combined sample isolation valve Facility 2 • RC- 001, RC hot leg isolation valve • RC- 002, pressurizer surge sample isolation valve • RC- 003, pressurizer steam sample isolation valve d. CHECK NO leakage into the RBCCW system by BOTH of the following: • CHECK RM-6038, RBCCW Radiation Monitor is NOT ALARMING OR increasing • CHECK RBCCW Surge Tank level not rising

	ATC	Check LOCA Inside of Containment *10. CHECK that the LOCA is occurring inside of containment by evaluating the following: a. NONE of the following Radiation Monitors Outside Containment have an unexplained alarm <u>OR</u> indicate an unexplained rise in activity: • RM- 7894, Charging Pump Area • RM- 7895, Primary Sample Sink • RM- 7896, - 25 ft 6 in Waste Process Area • RM- 7897, - 45 ft 6 in Waste Process Area • RM- 8169, Millstone Stack WR • RM- 8168, Unit 2 WR Stack
	BOP	b. CHECK that ALL of the following annunciators are not in alarm: • "AUX BLDG SUMP LEVEL HI" (C06, AA- 21) • "RBCCW RM SUMP LEVEL HI" (C06, AB- 21) • "SI RM A SUMP LEVEL HI" (C06, CA- 21) • "SI RM B SUMP LEVEL HI" (C06, CB- 21) • "SI RM C SUMP LEVEL HI" (C06, DA- 21) c. MONITOR Aerated Waste Tank levels for abnormal rise. d. MONITOR Clean Waste receiver tank levels for <u>NO</u> abnormal rise
	ATC	Place Hydrogen Analyzers in Service *11. USE EOP 2541, Appendix 19, Hydrogen Analyzer Operation. <u>AND</u> PLACE the hydrogen analyzers in service.
	ATC	Containment Isolation and Containment Cooling *12. PERFORM the following actions: a. CHECK EITHER of the following conditions exist: • Containment pressure is greater than or equal to 4.42 psig • Radiation monitors inside containment are greater than their alarm setpoints b. ENSURE SIAS, CIAS, EBFAS and MSI have actuated. (C01) c. CHECK that at least one train of SIAS, CIAS, EBFAS and MSI has properly actuated. (C01X) d. ENSURE ALL available CAR fans are operating: • CAR fans operating in slow speed • CAR emergency outlet valves open: • RB- 28.3A • RB- 28.3B • RB- 28.3C • RB- 28.3D e. START ALL available post- incident recirculation fans. f. CHECK Bus24C or 24D is energized from offsite power **RESPONSE NOT OBTAINED → PROCEED TO step 13**

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1	Event No.: **8**	Page **23** of **24**
Event Description: EOP 2532, Loss of Coolant Accident		
Symptoms/Cues: Directed by performance of Diagnostic Flowchart		

	ATC	Containment Spray Actuation *13. PERFORM the following actions for Containment Spray actuation: a. CHECK containment pressure is greater than or equal to 9.48 psig b. ENSURE CSAS actuated. (C01) c. ENSURE ALL available containment spray headers are providing flow greater than or equal to 1300 gpm.
	ATC	Containment Spray Termination *14. TERMINATE containment spray as follows: a. CHECK at least ONE containment spray pump operating. **RESPONSE NOT OBTAINED → PROCEED TO step 15**
	BOP	RBCCW Header Operating *15. PERFORM the following actions for EACH RBCCW header: a. CHECK RBCCW AND associated SW pumps operating b. CHECK ALL operating RCPs are supplied with RBCCW cooling flow.
	BOP	Close MSIVs on a Loss of Offsite Power *16. CHECK Main Condenser is available, as indicated by ALL the following: • At least ONE MSIV open • Condenser vacuum better than 15 “Hg-Abs (0” to 15”) • At least ONE Condensate pump operating • At least ONE Circ pump operating
	BOP	Align Instrument Air *17. CHECK instrument air pressure greater than 90 psig AND stable
	US	LOCA in Progress *18. CHECK LOCA is still in progress

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 1	Event No.: **8**	Page **24** of **24**
Event Description: EOP 2532, Loss of Coolant Accident		
Symptoms/Cues: Directed by performance of Diagnostic Flowchart		

	CREW	**NOTE** 1. The operator is required to initiate a RCS cooldown following an un-isolable LOCA no later than one hour after the event occurs. 2. After one hour, the operator will establish and maintain an average cooldown rate of greater than 40F/hr. (e.g., at two hours following the LOCA, the RCS is greater than 40˚F cooler than it was one hour following the LOCA) until the steam dump/bypass valves or ADVs are full open. 3. The starting point for the RCS cooldown should be the T_{COLD} or CET temperatures where RCS has stabilized. The PPC cooldown (˚F/hr.) display will indicate accurately after 'RCS STABLE'' is selected. 4. T_{COLD} should be used for monitoring RCS cooldown if in forced or natural circulation. CETs should be used for all other cases.
	US	Perform Controlled Cooldown *19. CHECK Steam Dumps to Condenser available. **a.** **TCOA** INITIATE a controlled cooldown using the steam dumps to establish shutdown cooling entry conditions. **b.** USE EOP 2541, Appendix 8, "Plant Cooldown," AND PERFORM supplemental cooldown actions.
CRITICAL TASK: **LOCA-09, Perform a Plant Cooldown** TIME of LOCA:_____ _____ TIME plant cooldown started:_____ _____		
When the event has been addressed to the lead examiner's satisfaction, the scenario is complete.		

SIMULATOR SCENARIO #2

Form 3.3-1 Scenario Outline

Facility:	Millstone Unit 2	Scenario #:	2
Scenario Source:	NRC Exam 2014-2	Op. Test #:	ES22LI1
Examiners:		Applicants/ Operators:	
Initial Conditions:	100% power, steady state operations		
Turnover:	'B' EDG RTO, 'B' SW pump running, aligned to 'B' SW header. Bus 24E is aligned to Bus 24D		
Critical Tasks:	1. Manually Shutdown the reactor prior to the US proceeding to the Maintenance of Vital Auxiliaries Safety Function. 2. Start the TDAFW pump within 10 minutes of a loss of feedwater		

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N – ATC/US	Swap Charging Pumps
2	SW01B	C - BOP/US TS - US	Trip of 'B' Service Water pump
3	ED02	TS - US	Loss of North Bus,
4	FW01	C - BOP/US	Lowering Condenser vacuum
5		R - All	Rapid Downpower
6	FW02	M - All	Loss of Vacuum (TRIP CRITERIA)
7	EG08A	C – BOP/US MC - BOP	'A' EDG fails to start (SBO).
8	RP27B	C – ATC/US MC - ATC	Failure of ALL RPS trips AND Manual trip pushbuttons

* (N)Normal, (R)Reactivity, (I)Instrument, (C)Component, (M)Major, (TS)Tech Spec, (MC)Manual Control

Quantitative Attribute	Target per Scenario	Actual
Events after EOP entry	1–2	2
Abnormal events	2–4	5
Major transients	1–2	1
EOPs entered/requiring substantive actions	1–2	1
Entry into a contingency EOP with substantive actions	1 per **scenario set**	0
Preidentified CTs	2 or more	2

Scenario Summary:

The crew will take the shift with the unit at 100% power, steady state, with the 'B' EDG OOS. The 'B' SW Pump is running, supplying the 'B' Service Water header.

Event 1: The ATC swaps Charging Pumps from P18C to P18A in Lead in accordance with OP 2304E, Charging Pumps; Section 4.2, Normal Charging Pump Operation.

Event 2: The 'B" Service Water Pump trips. The crew enters AOP 2565, Loss of Service Water, and starts the 'C' Service Water pump. The crew continues through the procedure. The US enters TS 3.7.4.1 for a Loss of a Service Water loop.

Event 3: The North bus de-energizes. There are no actions for the crew. The US enters TS 3.8.1.1.a for Loss of Off-Site lines.

Event 4: Condenser vacuum starts degrading, the crew enters AOP 2574, Loss of Condenser Vacuum.

Event 5: AOP 2574 directs the crew to AOP 2575, Rapid Downpower.

Event 6: Condenser Vacuum degrades to reactor trip criteria. The crew trips the plant.

Event 7: The Rx trip push buttons do not work, so the ATC opens the MG set feeder breakers to trip the reactor. The trip starts both the 10-minute Loss of Feedwater timer.

Event 8: On the trip, the 'A' Diesel fails to start. The BOP starts the Diesel. After 10 seconds, the diesel output breaker trips open, at that point, the BOP trips the 'A" EDG. The unit is now in a Station Blackout condition and the 60-minute SBO timer starts. The BOP starts the Terry Turbine. After completion of the Standard Post-Trip Actions, the crew diagnoses and enters EOP 2530, Station Blackout.

The scenario will end at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
EG11B	DG 13U AUTO START FAIL						0
RP27B	NO RPS AUTO TRIP						0
RP04A	MANUAL REACTOR TRIP (PB-1) FAIL						0
RP04B	MANUAL REACTOR TRIP (PB-2A) FAIL						0
RP04C	MANUAL REACTOR TRIP (PB-3A) FAIL						0
RP04D	MANUAL REACTOR TRIP (PB-4A) FAIL						0
SW01B	SERVICE WATER PUMP B TRIP			2			1
ED02	LOSS OF RSST			3			2
FW01A	LOSS OF CONDENSER VACUUM			4	5.6	5.6	3
FW01B	RAPID LOSS OF CONDENSER VACUUM			5	0.25	0.25	4
EG08A	DG 12U OUTPUT BRKR 15G-12U-2 FAIL			6			5
REMOTE FUNCTIONS							
EGR18	DIESEL GEN B (A401) RI/RO					RO	0
OVERRIDES							
06A1A5S34	D/G B MANUAL START/STOP (DIGITAL INPUT)					STOP	0

Critical Task Elements

Critical Task Statement	Manually Shutdown the reactor.
Initiating Cue	Indication that a reactor trip setpoint has been exceeded and the CEAs have not inserted.
Performance Feedback	Pushing the manual trip pushbuttons do NOT open the Trip Circuit breakers. When the MG set input breakers are opened, the CEAs insert fully. Rod bottom lights will light, power will start lowering and the core will have a negative start up rate.
Success Path	Opening the MG set input breakers.
Measurable Performance Standard	The operator opens the MG set input breakers prior to the US proceeding to the Maintenance of Vital auxiliaries Safety Function.

Critical Task Statement	Start the turbine-driven Auxiliary Feed (TDAFW) Pump within 10 minutes of a Loss of Feedwater
Initiating Cue	EOP 2525, Standard Post Trip Actions, step 7. RCS Heat Removal, RNO step a.1
Performance Feedback	Turbine-driven discharge pressure will increase with speed to a value greater than S/G pressure. At that point, there will be indication of feed flow to both steam generators.
Success Path	With no Main Feed or Motor-Driven Auxiliary Feed pumps available, the TDAFW pump is started to ensure RCS Heat Removal Safety Function is met.
Measurable Performance Standard	The operator will start the TDAFW pump by opening the steam inlet valve, then increase pump speed using the governor (‘SPD CNTL’) until feed flow is established within 10 minutes of a Loss of Feedwater.

Event Description: Swap Charging Pumps to 'A' in Lead

Symptoms/Cues: OP 2304E, Charging Pumps, Section 4.2, Normal Charging Pump Operaiton

Time	Position	Applicant's Actions or Behavior

Booth Operator: When directed to pre-lubricate the 'C' Charging pump packing, report the following for the 'C' Charging pump plunger flush pump:
• Pump has been running for greater than one minute with the following indications:
  • No abnormal noise or vibration
  • Seal tank level > ½ full
  • Pressure = 9 psig
  • Seal flow indicated
If queried, report the 'A' Charging pump suction and discharge valves are open and oil level is good.		

	ATC	Ensure 'A' Charging pump is in' Normal after Close' (Red flag) Position CHG PP BACK-UP CNTL switch to "2 & 3"position

Booth Operator: When queried for post-start checks on 'A' Charging pump, report the following:
• Pump has been running for greater than one minute with the following indications:
  • No abnormal noise or vibration
  • Power end oil pressure = 35 psig and stable
  • Power end oil temperature 115˚F and stable
  • Power end oil level = ¾ full
  • Seal tank level > ½ full
  • Pressure = 9 psig
  • Seal flow indicated		

When the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Event Description: 'B' Service Water Pump trip

Symptoms/Cues: Alarm SW PUMP B OVERLOAD/TRIP (C-06/7, AB-4)
Loss of 'B' Service Water Header flow, pump amperage = 0, pump red light *not* lit

Time	Position	Applicant's Actions or Behavior
Booth Operator: **WHEN** directed by Lead Examiner, **INSERT** Trigger #2 • SW01B, Service Water pump B Trip		
	US	Refers to ARP 2590E-026, SW PUMP B OVERLOAD/TRIP Enters AOP 2565, Loss of Service Water
	BOP	Checks 'A' Service Water ump aligned to Facility 1 Service Water Header Starts 'A' Service Water pump
	US	Goes to Section 5, AOP 2565, for trip of 'B' SW pump while providing 'A' header
	BOP	Closes SW-97B Places 'B' SW pump in Pull-To-Lock Monitors Header flow, Pump pressure, motor amperage Determine the cause of the pump malfunction
Booth operator: When directed to investigate SW pump trip, report the following: • Breaker A502 has Overcurrent relay target dropped, no other issues • 'B' SW pump has no abnormal indications		
	US	LCO 3.7.4.1 <u>SERVICE WATER SYSTEM</u> Two Service Water Loops shall be OPERABLE <u>APPLICABILITY:</u> modes 1, 2, 3 AND 4 <u>ACTION:</u> With one service water loop inoperable, restore the inoperable loop to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 36 hours. TRMAS 7.1.21 APPENDIX R SAFE SHUTDOWN REQUIREMENTS (14 day requirement)
	BOP	Refers to OP 2326A to complete alignment of 'A' Service Water pump
Booth Operator: **When** directed, **Insert** trigger #x and **report** SIAS/LNP ACTUATION SIGNAL HS 6484A in 'BLOCK' • HS6484A to BLOCK		
Booth Operator: When directed, report the following actions complete: • NaOCl suspended to 'B' SW pump • Post start checks complete 'A' SW pump • Packing leak-off from gland, Lube water flow through flush line flow gauge • No abnormal noises or vibrations • Proper discharge pressure and strainer ΔP • ΔP gauge vented		
	US	Log exit from: • TS LCO 3.7.4.1 • TRMAS 7.1.21
When the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Event Description: North bus de-energizes

Symptoms/Cues: RSST LOCKOUT CHANNEL 1(C-08, A3); RSST UNDERVOLTAGE (C-08, C3); RSST TROUBLE (C-08, D3); RSST PRIMARY TRANSFER TRIP OPERATION (C-08, B4); RSST BACKUP TRANSFER TRIP OPERATION (C-08, B5);NSST/RSST 4160 SUPPLY OUT OF SYNCH

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Booth Operator: WHEN directed by Lead Examiner, INSERT Trigger #3
• ED02, LOSS OF RSST</td></tr>
<tr><td></td><td>US</td><td>References one of the following ARPs:
• ARP 2590F-009, RSST LOCKOUT CHANNEL 1
• ARP 2590F-011, RSST UNDERVOLTAGE
• ARP 2590F-012, RSST TROUBLE
• ARP 2590F-014, RSST PRIMARY TRANSFER TRIP OPERATION
• ARP 2590F-018, RSST BACKUP TRANSFER TRIP OPERATION
• ARP 2590F-020, NSST/RSST 4160 SUPPLY OUT OF SYNCH</td></tr>
<tr><td></td><td>US</td><td>LCO 3.8.1.1 A.C. SOURCES – OPERATING
As a minimum, the following A.C. electrical sources shall be OPERABLE:
a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and
b. Two separate and independent diesel generators each with a separate fuel oil supply tank containing a minimum of 12,000 gallons of fuel.
APPLICABILITY: MODES 1, 2, 3 and4.
ACTION:
<table>
<tr><th>Inoperable equipment</th><th>Required ACTION</th></tr>
<tr><td>a. One offsite circuit</td><td>a.1 Perform Surveillance Requirement 4.8.1.1.1 for remaining offsite circuit within 1 hour prior to or after entering this condition, and at least once per 8 hours thereafter
AND
a.2 Restore the offsite circuit to OPERABLE status within 72 hours (within 10 days* if Required ACTION a.3 is met) or be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.
AND
a.3 With MPS3 in MODE 5, 6, or defueled, the MPS3 'A' RSST inoperable, and the MPS3 'A' NSST energized with breaker 15G-13T-2 (13T) and associated disconnect switches closed, restore either offsite circuit to OPERABLE status within 10 days* if the following requirements are met:
- Within 30 days prior to entering the 10-day* AOT, the availability of the supplemental power source (MPS3 SBO diesel generator) shall be verified.</td></tr>
</table></td></tr>
</table>

Event Description: North bus de-energizes

Symptoms/Cues: RSST LOCKOUT CHANNEL 1(C-08, A3); RSST UNDERVOLTAGE (C-08, C3); RSST TROUBLE (C-08, D3); RSST PRIMARY TRANSFER TRIP OPERATION (C-08, B4); RSST BACKUP TRANSFER TRIP OPERATION (C-08, B5);NSST/RSST 4160 SUPPLY OUT OF SYNCH

Time	Position	Applicant's Actions or Behavior
		- During the 10-day*AOT, the availability of the supplemental power source shall be checked once per shift. If the supplemental power source becomes unavailable at any time during the 10-day*AOT, restore to available status within 24 hours or be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours. - The risk management actions contained in DENC letter 20-109, Attachment 4 (also provided in TS Bases 3/4.8), shall remain in effect during the 10-day*AOT. * To facilitate replacement of the MPS3 'A' RSST and associated equipment, use of a one-time 35-day allowed outage time is permitted provided the requirements of Required ACTION a.3 are met. The work shall be completed no later than the end of MPS3 Refueling Outage 22 (fall 2023).
	US	Directs SP 2619G-001, AC Electrical Sources Inoperability, TS 3.8.1.1 ACTION a – One offsite Circuit Inoperable, be performed.

Booth Operator: When queried for the status of Unit 3 electrical alignment (SP 2619G-001), report the following:

- Unit 3 is on-line, 100% power
- NSST A Energized, No valid alarms
- 34A1-2 Closed
- NSSA-34A-2 Closed

When the event has been addressed to the lead examiner's satisfaction, proceed to the next event.

Event Description: Degrading vacuum

Symptoms/Cues: COND VACUUM LO (C-06/7, A-37)

Time	Position	Applicant's Actions or Behavior
Booth Operator: **WHEN** directed by Lead Examiner, **INSERT** Trigger #4 • FW01A, LOSS OF CONDENSER VACUUM		
	US	References ARP 2590E-185, COND VACUUM LO Enters AOP 2574, Loss of Condenser Vacuum
	US	Review Reactor trip criteria: • Reactor power and turbine load < 30% and backpressure > 5 "Hg • Backpressure approaching 7.5 "Hg AND reactor power > 15% If at any time, efforts to restore vacuum are unsuccessful. Refer to AOP 2575, Rapid Downpower and LOWER power until pressure stabilizes. NOTIFY ISO New England of imminent loss of unit.
Booth Operator: When directed, report the following (No actions required): • SJAE steam supply pressure = 225 psig • Both sets of SJAEs are in service • Local vacuum gages (Hoggers) = 28 "Hg • AR-11, AR-12A and AR-12B are OPEN • Traveling screen ΔP = 3 "H_2O • Trash rack ΔP = 1 "H_2O • Proper operation of CN-302 • A water seal exists in AR-17 • Condenser expansion joint filled • Condenser walk down with no indication of in-leakage • No recent or on-going maintenance activities in the Turbine building		
	BOP	Verify the following: • F55A or F55B operating • EB-55 and EB-56 OR EB-57 OPEN • SJAE supply pressure 200-250 psig • Both sets of SJAE in service
	BOP	Start both Mechanical Vacuum pumps Check Mechanical Vacuum pump pressure > 27 "Hg OPEN AR-11 OPEN AR-12A and AR-12B START F55A, Secure F55B, ENSURE EB-171 closed
	BOP	ENSURE the following: • all available circulating water pumps are operating • Available waterbox inlet and outlet valves are open

Event Description: Degrading vacuum

Symptoms/Cues: COND VACUUM LO (C-06/7, A-37)

Time	Position	Applicant's Actions or Behavior
		• Normal Circ water pump amperage • Traveling screen ΔP < 12 "H_2O • Trash rack ΔP < 9 "H_2O • Condenser ΔT < 26˚F
	BOP	ENSURE the following: • Condenser Steam Dumps and bypass valves are closed • proper operation of CN-302 • Steam Seal pressure between 2 and 6 psig • Condensate Surge tank level > 15% and *not* lowering • Turbine Exhaust hood temperature < 175˚F • AR-17 is closed • Water seal exists in AR-17 • Condenser expansion joint filled
	US	Transitions to AOP 2575, Rapid Downpower

Event Description: Rapid Downpower

Symptoms/Cues:

Time	Position	Applicant's Actions or Behavior
Examiner Note: AOP 2575, Rapid Downpower, is entered.		
	US	Perform notifications
	ATC	Initiate forcing sprays • Places all B/U heaters to 'ON' • Adjusts PRES CNTL-Y, PIC 100Y thumbwheel to achieve 50% output
	ATC BOP	Insert Group 7 CEAs 10 steps (8 – 12 steps in procedure) Reduce Turbine Load (LOAD SPEED CONTROL switch), maintain T_{COLD} ± 2°F of program.
	US	Determine Reactivity Plan Availability → Borate from RWST using 2 Charging Pumps
	BOP	Set up Turbine controls (Attachment G) • Select 'Load Setpt' and enter desired value → 14%. • Select 'Rate Setpt' and enter desired value → 30%/hour
	ATC	Raise Charging Flow – No actions taken, both charging pumps running from Event #4
	ATC	Borate from the RWST a. CHECK Boration from RWST - SELECTED b. CHECK VCT MAKEUP BYPASS, CH-196 - CLOSED c. CHECK RWST TO CHG SUCT, CH-504 - OPEN d. OPEN RWST ISOL, CH-192 e. CLOSE VCT OUT ISOL, CH-501
	BOP	Reduce turbine load when effects of boron are seen. • When ready to commence load reduction, then select 'Load Resume'. • IF Turbine Load Ramp Rate needs to be adjusted, perform any of the following: ○ SELECT 'Rate Setpt' AND ENTER new value. ○ SELECT one of the following: 5%, 10%, or 20% per hour ○ SELECT Raise or Lower (0.25% / hour change). Maintain T_{COLD} within 2 °F of program
	ATC	Maintain VCT parameters • Level 70 – 90% • Pressure < 30 psig
	CREW	Maintain parameters as specified in Attachment A
AFTER the BOP has seen the effects of the boration and commenced turbine load reduction **AND** the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Event Description: Rapid Loss of Vacuum

Symptoms/Cues: Lowering Condenser Vacuum. Reactor trip criteria met.

Time	Position	Applicant's Actions or Behavior
Booth Operator: **WHEN** directed by Lead Examiner, **INSERT** Trigger #5 • FW01B, RAPID LOSS OF CONDENSER VACUUM		
Manually Shutdown the reactor prior to the US proceeding to the Maintenance of Vital auxiliaries Safety Function.		
	ATC	Reactivity Control → Reactor Trip 1. Ensure Reactor Trip • All CEAs fully inserted • Reactor power is dropping • SUR is negative **RESPONSE NOT OBTAINED** 1.1 IF Reactor trip breakers are closed, THEN insert CEAs by any of the following methods: 1) PUSH the "RX TRIP TCBS" buttons 2) OPEN CEDM MG set feeder breakers 3) OPEN the reactor trip circuit breakers (Local)
	BOP	Reactivity Control →Turbine Trip 2. Ensure Turbine trip • Stop valves and Control valves are closed • Generator Megawatts indicate zero • Turbine speed lowering
	BOP	Maintenance of Vital Auxiliaries 3. Ensure Maintenance of Vital Auxiliaries is met by ALL of the following conditions: a. CHECK Open Phase Condition annunciator RSST OPEN PHASE (C-06/7, C-48) – <u>NOT</u> LIT b. CHECK vital and non-vital loads - ENERGIZED **RESPONSE NOT OBTAINED (All 6.9 kV and 4160 V buses de-energized)** b.1 Bus 24C de-energized 1) Containment pressure is < 20 psig 2) ENSURE diesel generator has started 3) ENSURE vital to non-vital tie breaker is open 4) Ensure EDG output breaker synchronizing switch is 'ON' 5) ENSURE EDG output breaker is closed
Examiner Note: Power will be restored to bus 24C temporarily, then lost again when the breaker trips open (after the US finishes with Vital Auxiliaries). The crew will return to the step to energize the bus and end up tripping the diesel.		

Event Description: Rapid Loss of Vacuum

Symptoms/Cues: Lowering Condenser Vacuum. Reactor trip criteria met.

Booth Operator: **WHEN** the crew is completed Maintenance of Vital Auxiliaries, **INSERT** Trigger #6 • EG08A, DG 12U OUTPUT BRKR 15G-12U-2 FAIL		
		6) IF EDG output breaker cannot be closed, then TRIP the EDG
	BOP	Maintenance of Vital Auxiliaries c. CHECK that both facilities of Service Water are operating **RESPONSE NOT OBTAINED** c.1 No actions to take
	BOP	d. CHECK that both facilities of RBCCW are operating with Service Water cooling. **RESPONSE NOT OBTAINED** d.1 If a SW pump is NOT running, place the associated RBCCW pump in Pull-To-Lock
	ATC	RCS Inventory Control → Pressurizer level < 20% a. Pressurizer level is between 20 to 80%, trending to 35 to 70%.
	ATC	RCS Pressure Control a. CHECK that pressurizer pressure is 1900 to 2350 psia, trending to 2225 to 2300 psia
	ATC	Core Heat Removal a. CHECK at least **1** RCP is operating, AND loop ΔT < 10 °F **RESPONSE NOT OBTAINED** a.1 IF RCPs are *not* operating, OR loop ΔT is greater than 10°F, THEN PERFORM the following: 1) PLACE TIC-4165, steam dump TAVG controller, in manual and closed. 2) PLACE **BOTH** pressurizer spray valve controllers in manual and CLOSE the valves. • HIC-100E • HIC-100F b. RCS subcooling > 30 °F
Start the turbine-driven Auxiliary Feed (TDAFW) Pump within 10 minutes of a Loss of Feedwater.		
	BOP	RCS Heat Removal a. At least one S/G has BOTH of the following conditions met: • Level 10% to 80%. • Main feedwater or TCOA**:** TWO auxiliary feedwater pumps operating to restore level between 40% to 70%. **RESPONSE NOT OBTAINED** a.1 RESTORE level to between 40% and 70% in at least ONE SG using **ANY** of the following: • TDAFW Pump. Refer to Appendix 6, TDAFW Pump Normal Startup. b. RCS TCOLD is being maintained between 530 °F to 535 °F c. BOTH S/G pressures are 880 to 920 psia.

Event Description: Rapid Loss of Vacuum

Symptoms/Cues: Lowering Condenser Vacuum. Reactor trip criteria met.

	ATC	Containment Isolation – met a. CTMT pressure < 1.0 psig b. No primary plant rad monitors have an unexplained rise or are in alarm c. No steam plant rad monitors have an unexpected rise or are in alarm
	ATC	Containment Temperature and Pressure Control – met a. CTMT temperature < 120 °F **RESPONSE NOT OBTAINED** a.1 ENSURE **ALL** available normal cooling and ventilation systems are OPERATING: • CAR fans operating on the facility with an operating train of RBCCW • CTMT Aux Circ fans b. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED** b.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS actuated. (C01) • CIAS actuated. (C01) • EBFAS actuated. (C01) • MSI actuated. (C01)
	ATC BOP	Perform Appendix 4, Reactor Trip Subsequent Actions
	US	Diagnose the event a. Diagnostic Flowchart directs operator to EOP 2530, Station Blackout

Event Description: EOP 2530, Station Blackout

Symptoms/Cues:

Time	Position	Applicant's Actions or Behavior
	US	Confirm Diagnosis • Monitor Safety Function Status Check (hand off to STA)
	US	Classify the event (hand off to SM) Record EOP entry time Place Master Alarm Silence in NORMAL CHECK EOP 2525, Standard Post Trip Actions, performed
	US	Check Vital 4160V expected to be restored within 30 minutes of event initiation. TCOA: USE EOP 2541, Appendix 14, Supplemental Cooling on Loss of Ventilation, AND WITHIN 30 minutes of event initiation, ALIGN Supplemental cooling for ALL Vital Equipment (De-energizes PPC)
	BOP	6. Check Main Condenser Available **RESPONSE NOT OBTAINED** 6.1 PERFORM the Following: • Close BOTH MSIVs • ENSURE MSIV Bypass valves are closed • OPEN AR-17
	BOP	7. Maintain Secondary Inventory • CLOSE both low point drains MS-265B, MS-266B • CLOSE B/D valves MS-220A, MS220B • CLOSE Sample valves MS-191A, Ms-191B
	ATC	8. TCOA REDUCE RCS leakage within 1 hour of event initiation. As follows: • CLOSE both Letdown isolation valves CH-515 & CH-516 • Place all de-energized charging pumps in Pull-To-Lock • CLOSE RCP Bleed-off isolation RC-506 • CHECH RCS Sample valves closed. RC-001, RC-002, RC-003, RC-045
	BOP	ENSURE RCS T_{COLD} is being maintained < 535 °F by operating ADVs ENSURE SG level is being restored by the TDAFW pump
	BOP	ENSURE all feeder breakers on de-energized 4160V and 6.9kV are open. EOP 2541 Appendix 39, Opening Supply Breakers on De-energized Electrical Buses
	US	When All feeder breakers are open, USE EOP 2541, Appendix 23, Restoring Electrical Power and Energize ONE vital electrical bus. Refers To Appendix 23, Attachment 23-N, Energizing 4.16kV Bus 24E from Unit 3

Event Description: EOP 2530, Station Blackout

Symptoms/Cues:

	BOP	Obtains permission from Unit 3 to energize Bus 24E from Unit 3 Bus 34A/B ENSURE 4.16kV Bus 24E 'SPLY VOLTS' voltage is indicated Place 'SYNC SEL SW, 34B-24E-2' to ON and check 'INCOMING' voltage indicated CLOSE A505, '24E/34B TIE BKR' CHECK voltage on 'RUNNING' voltmeter REFER to Attachment 23-U, 3MVA Electrical Limit on Bus 34A/B and ENSURE 3MVA is *not* exceeded as loads are restored to service
	BOP	As directed by US, REALIGN and place the following pumps in service: • 'B' RBCCW
	US	restore power to Bus 24 C(D) iaw Appendix 23-D(G), Energizing 4.16kV Bus 24C(D) from 24E
	BOP	Check no faults on Bus 24C(D) Check Bus 24E energized from Bus 34A/B Ensure the following breakers open: • A312 (A401), EDG Output Breaker • A302 (A411), RSST Supply Breaker • A304 (A410), 24A(B)/24C(D) tie breaker • A408 (A305), 24D(C)/24E tie breaker Ensure A305 (A408), 24C(D)/24E tie breaker is open Check A305 (A408), 24C(D)/24E tie breaker is racked up Notify Unit 3 SM that unit 2 bus 24C(D) is going to be energized for bus 34A/B
	BOP	Place ALL four ESAS 'UV BUS A3(4)' into 'INHIBIT' position (Key#26) Press Facility 1(2) UV RESET button (ESF Actuation Cabinet 5(6) Ensure Facility 1(2) sequencer reset: • Sequence zero light *not* lit • Sequence 1 through 4 lights lit • Diesel breaker lit
	BOP	Place the following in Pull-To-Lock: • A(C)RBCCW pump • A(C)Service Water pump • BOTH Auto AFW 'OVERIDE/MAN/START/RESET' handswitches Place A(B) AFW pump in Normal After Trip If actuated, override the following to prevent restart: • A(C) HPSI pump • A(B) LPSI pump • A(B) Containment Spray pump • A(B) AFW pump

Event Description: EOP 2530, Station Blackout

Symptoms/Cues:

	BOP	CLOSE A305(A408) and observe Bus 24C(D) volts increase
Examiner Note: Please ensure the operator returns the keys to the key locker. A common occurrence is for the operator to place the keys in their pocket which could jeopardize exam security if the keys leave the simulator.		
	BOP	Reset all bus 24C(D) undervoltage sensor trips Place ALL four ESAS 'UV BUS A3(4)' channel bypass switches into 'OPERATE' position and REMOVE keys (Key #26)
	BOP	Ensure 3 MVA limits are not exceeded
When the event has been addressed to the lead examiner's satisfaction, the scenario is complete.		

SIMULATOR SCENARIO #3

Form 3.3-1 Scenario Outline

Facility:	Millstone Unit 2	Scenario #:	3
Scenario Source:		Op. Test #:	ES22LI1
Examiners:		Applicants/	
		Operators:	

Initial Conditions: 100% power, steady state operations, 'A' Train protected.

Turnover: RM-8240, CTMT Hi Range RM-8241 Out of Service for repairs.

Critical Tasks: (see page 5)

1. Cooldown the RCS to < 515° F prior to isolating the affected S/G
2. Secure all RCPs within 10 minutes of losing NPSH
3. Isolated the affected S/G within 60 minutes of the SGTR.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N – ATC/US	Place F14B in STBY, start F14D in Fast Speed
2	RX21D	C - BOP/US MC – BOP TS - US	#2 ADV fails open
3	RM01K	TS -US	RM-8241, CTMT High Range RM, failure
4	SG01B	C – BOP/US TS - US	#2 S/G Tube leak
5	N/A	RX - ALL	Rapid Downpower
6	SG02B	M - All	#2 Tube Rupture (TRIP CRITERIA)
7	RC04	N/A	LOCA occurs on trip
8	SI05A ES033	C – ATC/US MC - ATC	'A" HPSI pump degraded, 'C' HPSI pump not running

* (N)Normal, (R)Reactivity, (I)Instrument, (C)Component, (M)Major, (TS)Tech Spec, (MC)Manual Control

Quantitative Attribute	Target per Scenario	Actual
Events after EOP entry	1–2	1
Abnormal events	2–4	4
Major transients	1–2	1
EOPs entered/requiring substantive actions	1–2	1
Entry into a contingency EOP with substantive actions	1 per **scenario set**	1
Pre-identified CTs	2 or more	3

Scenario Summary:

The crew will take the shift with the unit at 100% power, steady state, no equipment OOS (IC-21).

Event 1: The ATC places F14B in STBY and starts F14D in FAST in accordance with OP 2313A, Containment Recirculation and Cooling System.

Event 2: #1 Atmospheric Dump Valve (ADV) fails open due to controller output failing high. The BOP takes Immediate Operator Actions to take manual control of the ADV and closes it.

Event 3: RM-8241, CTMT High Range Rad Monitor, fails. The US refers to TSAS 3.3.3.1.b and Table3.3-6 then determines the plant meets the minimum channels requirement with RM-8240 still OPERABLE

Event 4: A 90 gallon per day tube leak occurs in the #2 S/G. The crew enters AOP 2569, Steam Generator Tube Leak, and determines the plant is required to taken off line. The US enters TSAS 3.4.6.2.c due to > 75 gpd leakage through any one S/G

Event 5: The crew commences a downpower iaw AOP 2575, Rapid Downpower

Event 6: A S/G tube rupture occurs. The crew trips the unit and enters EOP 2525, Standard Post Trip Actions. The 60-minute clock for isolating #2 S/G starts here.

Event7: A LOCA occurs at the time of the trip. Multiple events are diagnosed and the crew transitions to EOP 2540, Functional Recovery. Containment Isolation Safety Function is determined not to be met. The crew enters EOP 2540E, Functional Recovery of Containment Isolation. The plant is cooled down and the #2 S/G is isolated

Event 8: The 'A' HPSI pump is degraded and the 'C' HPSI pump does not start on the SIAS signal. The ATC takes action to start the 'C' HPSI pump.

The scenario will end at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Number	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
ES03J	SIAS SIGNAL FAIL TO ACTUATE AM-614	-	-	-	-	-	0
RX21D	PIC 4224 setpoint to IA fail	-	-	2	0%	0%	1
RM01K	CTMT ARM R8241	-	-	3	100%	100%	2
SG01B	SG #2 TUBE LEAK(SMALL)	-	-	4	0.0750	0.0750	3
SG02B	S/G #2 Tube Rupture	-	-	5	300	300	4
RC04	RX HEAD VENT LEAK	-	-	30	322	322	5
SI05A	HPSI PP A DEGRADED PERFORMANCE	-	-	20	28	28	5
REMOTE FUNCTIONS							
MSR13	2-MS-202 DISCONNECT STATUS	-	-	-	-	RI	-
OVERRIDES							
EVENT FILES							

Critical Tasks Elements

Critical Task Statement	Cooldown the RCS prior to isolating the faulted Steam Generator.
Initiating Cue	EOP 2541, Appendix 12, SGTR Response; step 1. Commence Cooldown to T_H Less Than 515˚F
Performance Feedback	A cooldown of RCS temperatures, within Technical Specification limits (< 100˚F/hour), should be observed. Note that the temperature change limits are for a continuous 1 hour period.
Success Path	The plant cooldown is performed by operating either the Atmospheric Dump Valves or the Condenser Steam Dump valves.
Measurable Performance Standard	The plant is cooled down to both loops T_{HOT} temperatures are less than 515˚F prior to isolating the faulted Steam Generator.

Critical Task Statement	Secure all RCPs within 10 minutes of losing NPSH
Initiating Cue	RCS Pressure drops below the operating limit of the Reactor Coolant Pumps
Performance Feedback	The RCPs are secured, causing Hot leg temperatures to increase as natural circulation heat removal is established. Steam dumps/ADVs throttle open to maintain T_{AVE}/S/G pressure.
Success Path	Opening the RCP breakers.
Measurable Performance Standard	The operator is observed to commence a plant cooldown no later than one hour after an un-isolable LOCA occurs. A cooldown rate of greater than 40˚F/hour shall be established and maintained.

Critical Task Statement	Isolate the affected steam generator.
Initiating Cue	EOP 2541, Appendix 12, SGTR Response; step 7. Isolate Most Affected S/G
Performance Feedback	The positioning of components is observable by lights, switches and other control indications. When isolated, the affected S/G pressure will stabilize since no more steam is being drawn off and the affected loops' ΔT will go to zero as the SG is no longer available as a heat sink.
Success Path	The affected S/G is isolated by performing the component manipulations to establish the desired plant condition of the affected S/G being isolated from the outside environment.
Measurable Performance Standard	The affected S/G is isolated within 60 minutes of the Tube Rupture.

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3 Event No.: **1** Page **6** of **20**

Event Description: OP 2313A, Containment Air Recirculation and Cooling System.
Swap CAR fans. B → Standby; D → Fast Speed

Symptoms/Cues: None

Time	Position	Applicant's Actions or Behavior
	ATC	PLACE 'B' CAR to STOP and HOLD for 2 seconds. WHEN 2 seconds elapse, RELEASE 'B' CAR fan switch.
	ATC	ENSURE the following OPEN: • RB-28.2D, NORM OUTLET • RB-28.3D, EMERG OUTLET • RB-28.1D, CLR D INLET (Locked open) CHECK 'B' RBCCW header flow <8000 gpm PLACE 'D' CAR fan to START HIGH and OBSERVE red FAST SPEED indicating light lit PRESS 'CAR FAN VIB RESET B&D' button
When the event has been addressed to the lead examiner's satisfaction, proceed to the next event		

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3 Event No.: **2** Page **7** of **20**

Event Description: #1 Atmospheric Dump Valve (ADV) fails open

Symptoms/Cues: PIC-4224 controller output fails to 100% and #2 ADV opens (red light lit)

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Critical Task:</td></tr>
<tr><td colspan="3">Booth Operator: When directed by Lead Examiner, Insert Trigger #2
• RX21D, PIC 4224 setpoint to IA fail (0%)</td></tr>
<tr><td></td><td>BOP</td><td>Performs OP 2585, Immediate Operator Actions, for S/G ADV failing open (memory):
1. Check affected S/G pressure < ADV setpoint
a. SG pressure is less than setpoint
2. IF controller is failed,
a. PLACE affected ADV controller to manual and
b. ENSURE ADV is closed.</td></tr>
<tr><td></td><td>US</td><td>LCO 3.2.6 DNB Margin
The DNB margin shall be preserved by maintaining the cold leg temperature, pressurizer, reactor coolant flow rate, and AXIAL SHAPE INDEX within limits specified in the CORE OPERATING LIMITS REPORT
APPLICABILITY: MODE
ACTION: With any of the above parameters exceeding its specified limits, restore the parameter to within its above specified limits within 2 hours or reduce THERMAL POWER to < 5% of RATED THERMAL POWER within the next 4 hours.

CORE OPERATING LIMITS REPORT:
2.7 DNB
The DNB margin shall be preserved by maintaining the cold leg temperature, pressurizer, reactor coolant flow rate, and AXIAL SHAPE INDEX within the following limits:
<table>
<tr><td>Parameter</td><td>Limits</td></tr>
<tr><td>Cold Leg Temperature</td><td>≤ 549˚F</td></tr>
<tr><td>Pressurizer Pressure</td><td>> 2225 psia*</td></tr>
<tr><td>Reactor Coolant Flow Rate</td><td>≥360,000 gpm</td></tr>
<tr><td>AXIAL SHAPE INDEX</td><td>Figure 2.7-1</td></tr>
</table>
*Limit not applicable during either the THERMAL POWER ramp increase in excess of 5% of RATED THERMAL POWER per minute or a THERMAL POWER step increase of greater than 10% of RATED THERMAL POWER.</td></tr>
<tr><td colspan="3">Examiner Note: The ADV only needs to be able to be operated in local manual to remain OPERABLE</td></tr>
<tr><td></td><td>US</td><td>LCO 3.7.1.7 ATMOSPHERIC DUMP VALVES
Each atmospheric dump valve shall be OPERABLE.
SURVEILLANCE REQUIREMENT
4.7.1.7 Verify the OPERABILITY of each atmospheric dump valve by local manual operation of each valve in the flowpath through on complete cycle of operation at the frequency specified in the Surveillance Frequency Control Program.</td></tr>
<tr><td colspan="3">When the event has been addressed to the lead examiner's satisfaction, proceed to the next event</td></tr>
</table>

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3 Event No.: **3** Page **8** of **20**

Event Description: RM-8241, CTMT High Range Rad Monitor, fails.

Symptoms/Cues: RM-8241, CTMT HI RANGE RM, Hi Rad (red) and Alert (yellow) lights lit.
The following alarms are received:

- HYDROGEN PURGE ISOL VLVS HI RAD (C-01, C-30)
- POST INCIDENT RAD MONITOR HI/FAILURE (C-02, D-10)

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td colspan="3">Booth Operator: When directed by Lead Examiner, Insert Trigger #3
• RM01K, CTMT ARM 8241 fail (100%)</td></tr>
<tr><td></td><td>US</td><td>References the following ARPs:
• ARP 2590A-119, HYDROGEN PURGE ISOL VLVS HI RAD (C-01, C-30)
• ARP 2590B-040, POST INCIDENT RAD MONITOR HI/FAILURE
Both ARPs direct the operator to Technical Specification 3.3.3.1</td></tr>
<tr><td></td><td>ATC</td><td>VERIFY Hydrogen Purge Valves are closed</td></tr>
<tr><td></td><td>US</td><td>LCO 3.3.3.1 MONITORING INSTRUMENTATION:
The radiation monitoring instrumentation channels shown in Table 3.363 shall be OPERABLE with their alarm/trip setpoints within the specified limits
<u>APPLICABILITY</u>: As shown in Table 3.3-6.
<u>ACTION</u>:
a. With a radiation monitoring channel alarm/trip setpoint exceeding the value shown in Table 3.3-3, adjust the setpoint to within the limit within 2 hours or declare the channel inoperable.
b. With the number of OPERABLE channels less than the number of MINIMUM CHANNELS OPERABLE in Table 3.3-6, take the ACTION shown in Table 3.3-6. The provisions of Specification 3.0.3 are not applicable
<table>
<tr><th>Instrument</th><th>MINIMUM CHANNELS OPERABLE</th><th>Applicable MODES</th><th>Alarm/Trip Setpoint</th><th>Action</th></tr>
<tr><td>CTMT High Range</td><td>1</td><td>1,2,3,4</td><td>100 R/hr</td><td>17</td></tr>
</table>
ACTION 17 - With the number of OPERABLE channels less than required by the MINIMUM CHANNELS OPERABLE requirements, initiate the preplanned alternate method of monitoring the appropriate parameter(s), within 72 hours, and:
1. Either restore the inoperable(s) channels to OPERABLE status within 7 days of the discovery or
2. Prepare and submit a Special Report to the Commission pursuant to Specification 6.9.2 within 14 days following discovery outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status</td></tr>
<tr><td colspan="3">When the event has been addressed to the lead examiner's satisfaction, proceed to the next event</td></tr>
</table>

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3 Event No.: **4** Page **9** of **20**

Event Description: AOP 2569, Steam Generator Tube Leak

Symptoms/Cues: The following alarm is received coincident with rising SJAE RM-5099 trends (PPC):

- N-16 ALERT (CB-19, C-06/7)

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger #**4** • SG01B, SG #2 TUBE LEAK (SMALL)		
	US	References the following ARP: • ARP 2590E-94, N-16 ALERT (CB-19, C-06/7) The ARP direct the operator to validate the alarm with RMs (5099, SJAE and 4262, B/D) and Chemistry samples. If a SGTL is confirmed, Refer to AOP 2569, Steam Generator Tube Leak.
	US	Enters AOP 2569, Steam Generator Tube Leak.
	US	Determine trip Criteria met. • Trip criteria NOT met. US reviews trip criteria with crew.
	ATC	Monitor Loss of RCS Inventory • Check Pressurizer level lowering • Adjusts LTDN FLOW CNTL, HIC-110 to stabilize pressurizer level • Determines RCS leak rate
	BOP	Request Chemistry sample both S/Gs
	US	Determine Notification AND Technical Specification Applicability
	US	LCO 3.4.6.2 REACTOR COOLANT OPERATIONAL LEAKAGE: Reactor Coolant System Operational Leakage shall limited to: a. No PRESSURE BOUNDARY LEAKAGE, b. 1 GPM UNIDENTIFIED LEAKAGE, c. 75 GPD primary to secondary LEAKAGE through any steam generator, and d. 10 GPM IDENTIFIED LEAKAGE. APPLICABILITY: modes 1, 2, 3, AND 4. ACTION: a. With any operational LEAKAGE not within limits for reasons other than PRESSURE BOUNDARY LEAKAGE or primary to secondary LEAKAGE not within limits, reduce LEAKAGE to within limits within 4 hours. b. With ACTION and associated completion time of ACTION a. not met, or PRESSURE BOUNDARY LEAKAGE exists, or primary to secondary LEAKAGE not within limits, be in HOT STANDBY within 6 hours and be in COLD SHUTDOWN within 36 hours.
	US	Notifies HP and OMOC of S/G Tube Leak

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1	Scenario No.: 3	Event No.: **4**	Page **10** of **20**

Event Description: AOP 2569, Steam Generator Tube Leak

Symptoms/Cues: The following alarm is received coincident with rising SJAE RM-5099 trends (PPC):

- N-16 ALERT (CB-19, C-06/7)

	BOP	Monitor N-16 Radiation Monitors. • N-16 HIGH (CA-19, C-06/7) • N-16 ALERT (CB-19, C-06/7) is in alarm Check alarm valid based on: • R-5099, SJAE - rising • R-4262, Blowdown RM • RCS leak rate – UNEXPLAINED RISE (PPC) • Chemistry sample Using PPC N-16 Pri/Sec leakage screen Check for **both** of the following: • Primary to secondary leak rate > 75 gpm • Primary to secondary leak rate rising by ≥ 15 gpd/ 30 min. Perform BOTH the following: • Using AOP 2575, Rapid Downpower, reduce power to < 50 % in 1 hour • Within the following 2 hours, enter MODE 3, HOT STANDBY, while continuing with AOP 2569, step 9.
	CREW	Transitions to AOP 2575, Rapid Downpower

Form 3.3-2 Required Operator Actions

Op. Test No.:ES22LI1 Scenario No.: 3	Event No.: **5**	Page **11** of **20**
Event Description: Rapid Downpower		
Symptoms/Cues: Directed from AOP 2569, Steam Generator Tube Leak		

Time	Position	Applicant's Actions or Behavior
Examiner Note: AOP 2575, Rapid Downpower, is entered.		
	US	Perform notifications
	ATC	Initiate forcing sprays • Places all B/U heaters to 'ON' • Adjusts PRES CNTL-Y, PIC 100Y thumbwheel to achieve 50% output
	ATC BOP	Insert Group 7 CEAs 10 steps (8 – 12 steps in procedure) Reduce Turbine Load (LOAD SPEED CONTROL switch), maintain T_{COLD} ± 2°F of program.
	US	Determine Reactivity Plan Availability → Borate from RWST using 2 Charging Pumps
	BOP	Set up Turbine controls (Attachment G) • Select 'Load Setpt' and enter desired value → 14%. • Select 'Rate Setpt' and enter desired value → 30%/hour
	ATC	Raise Charging Flow – No actions taken, both charging pumps running from Event #4
	ATC	Borate from the RWST a. CHECK Boration from RWST - SELECTED b. CHECK VCT MAKEUP BYPASS, CH-196 - CLOSED c. CHECK RWST TO CHG SUCT, CH-504 - OPEN d. OPEN RWST ISOL, CH-192 e. CLOSE VCT OUT ISOL, CH-501
	BOP	Reduce turbine load when effects of boron are seen. • When ready to commence load reduction, then select 'Load Resume'. • IF Turbine Load Ramp Rate needs to be adjusted, perform any of the following: ○ SELECT 'Rate Setpt' AND ENTER new value. ○ SELECT one of the following: 5%, 10%, or 20% per hour ○ SELECT Raise or Lower (0.25% / hour change). Maintain T_{COLD} within 2 °F of program
	ATC	Maintain VCT parameters • Level 70 – 90% • Pressure < 30 psig
	CREW	Maintain parameters as specified in Attachment A
AFTER the BOP has seen the effects of the boration and commenced turbine load reduction **AND** the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Form 3.3-2 Required Operator Actions

Op. Test No.:ES22LI1 Scenario No.: 3 Event No.: **6** Page **12** of **20**

Event Description: #2 S/G tube rupture. Plant trip.

Symptoms/Cues:

- MAIN STEAM LINE HI RAD/INST. FAIL (C-01, A-30) alarms
- Lowering RCS pressure and temperature

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger #**5** • SG02B, SG #2 TUBE RUPTURE		
Examiner Note: The reactor trip due to SGTR starts the 60 minute clock for isolating the ruptured S/G		
	ATC	Reactivity Control → Reactor Trip Ensure Reactor Trip
	BOP	Reactivity Control →Turbine Trip Ensure Turbine trip
	BOP	Maintenance of Vital Auxiliaries No Open Phase Condition All busses energized
	BOP	Maintenance of Vital Auxiliaries RBCCW and Service Water headers operating.
	ATC	RCS Inventory Control → Pressurizer level < 20% a. Pressurizer level is between 20 to 80%, trending to 35 to 70%. **RESPONSE NOT OBTAINED** a.1 Start the 3rd charging pump and secure Letdown b. RCS subcooling > 30 °F
Critical Task: Secure RCPs within 10 minutes of losing NPSH.		
	ATC	RCS Pressure Control a. CHECK that pressurizer pressure is 1900 to 2350 psia, trending to 2225 to 2300 psia. **RESPONSE NOT OBTAINED** • OPERATE the Pressurizer Pressure Control System. Manually OPERATE pressurizer heaters and spray valves. • IF pressurizer pressure is less than 1714 psia AND SIAS actuated, THEN ENSURE ONE RCP in each loop is stopped. • **TCOA**: IF Pressurizer pressure lowers to less than the minimum of Fig. 2 "RCP NPSH Curve" THEN STOP ALL RCPs

Form 3.3-2 Required Operator Actions

Op. Test No.:ES22LI1	Scenario No.: 3	Event No.: **6**	Page **13** of **20**

Event Description: #2 S/G tube rupture. Plant trip.

Symptoms/Cues:

- MAIN STEAM LINE HI RAD/INST. FAIL (C-01, A-30) alarms
- Lowering RCS pressure and temperature

	ATC	Core Heat Removal a. CHECK at least **1** RCP is operating, AND loop ΔT < 10 °F **RESPONSE NOT OBTAINED** b.1 IF RCPs are *not* operating, OR loop ΔT is greater than 10°F, THEN PERFORM the following: 1) PLACE TIC-4165, steam dump TAVG controller, in manual and closed. 2) PLACE **BOTH** pressurizer spray valve controllers in manual and CLOSE the valves. • HIC-100E • HIC-100F b. RCS subcooling > 30 °F
	BOP	RCS Heat Removal a. At least one S/G has BOTH of the following conditions met: • Level 10% to 80%. • Main feedwater or TCOA**:** TWO auxiliary feedwater pumps operating to restore level between 40% to 70%. b. RCS T_{COLD} is being maintained between 530 °F to 535 °F c. BOTH S/G pressures are 880 to 920 psia.
Examiner Note: The 'C' HPSI pump did not start on SIAS signal ('A' HPSI is degraded).		
	ATC	Containment Isolation – met a. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED – No actions** a.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS actuated. (C01) • CIAS actuated. (C01) • EBFAS actuated. (C01) • MSI actuated. (C01) b. No primary plant rad monitors have an unexplained rise or are in alarm • RM-7891 has unexplained rise c. No steam plant rad monitors have an unexpected rise or are in alarm • RM-5099 is in alarm

Form 3.3-2 Required Operator Actions

Op. Test No.:ES22LI1	Scenario No.: 3	Event No.: **6**	Page **14** of **20**

Event Description: #2 S/G tube rupture. Plant trip.

Symptoms/Cues:

- MAIN STEAM LINE HI RAD/INST. FAIL (C-01, A-30) alarms
- Lowering RCS pressure and temperature

	ATC	Containment Temperature and Pressure Control – met a. CTMT temperature < 120 °F **RESPONSE NOT OBTAINED** a.1 ENSURE **ALL** available normal cooling and ventilation systems are OPERATING: • CAR fans operating on the facility with an operating train of RBCCW • CTMT Aux Circ fans b. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED** b.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS actuated. (C01) • CIAS actuated. (C01) • EBFAS actuated. (C01) • MSI actuated. (C01)
	ATC BOP	Perform Appendix 4, Reactor Trip Subsequent Actions
	US	Diagnose the event a. Diagnostic Flowchart directs operator to EOP 2540, Functional Recovery, due to indications of two events (SGTR and LOCA).

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3	Event No.: **8**	Page **15** of **20**
Event Description: EOP 2540E, Functional Recovery of Containment Isolation		
Symptoms/Cues: Directed by Diagnostic Flowpath		

Time	Position	Applicant's Actions or Behavior
Booth Operator: When directed by the crew to CLOSE MS-202 disconnect, REPORT the disconnect closed.		
Examiner Note: the crew enters EOP 2540, Functional Recovery		
	US	1. Classify the event 2. PERFORM ALL of the following • OPEN the Safety Function Tracking Page and ENTER the EOP entry time. • ENSURE the master alarm silence switch is in 'NORMAL'
	ATC	3. IF pressurizer pressure is less than 1714 psia AND SIAS has initiated, PERFORM the following: a. ENSURE ONE RCP in each loop is stopped. b. PLACE associated pressurizer spray valve controller RC-100E or RC-100F in manual and CLOSE the valve c. IF pressurizer pressure lowers to less than the minimum RCP NPSH limit, PERFORM the following: 1) STOP ALL RCPs 2) PLACE TIC-4165, steam dump T_{AVG} controller, in manual and closed 3) PLACE pressurizer spray valve controllers RC-100E and RC-100F in manual and CLOSE the valve
	BOP	4. Sample steam generators that are available for heat removal as follows: a. CHECK "B" train RBCCW in service. b. ENSURE RB-210, SAMPLE/DEGAS EFF CLR ISOL, is open c. OPEN the steam generator sample valves: • MS- 191A • MS- 191B d. DIRECT Chemistry to perform ALL of the following: • Sample ANY steam generator that is available for heat removal • Frisk the samples • Report the frisk results • Analyze the samples for boron and activity e. WHEN Chemistry reports that samples have been taken, PERFORM the following: • CLOSE steam generator sample valves • IF SIAS has actuated, AND no other sampling is in progress, CLOSERB-210, SAMPLE/DEGAS EFF CLR ISOL
		5. PLACE hydrogen analyzers in service, Refer To Appendix 19, Hydrogen Analyzer Operation

Op. Test No.: ES22LI1 Scenario No.: 3 Event No.: **8** Page **16** of **20**

Event Description: EOP 2540E, Functional Recovery of Containment Isolation

Symptoms/Cues: Directed by Diagnostic Flowpath

<table>
<tr><th>Time</th><th>Position</th><th>Applicant's Actions or Behavior</th></tr>
<tr><td></td><td>US</td><td>NOTE: If the Safety Function Status Checklist is not satisfied for the selected success path, the US may commence the operator actions for safety functions which are not met based on Safety Function hierarchy. The remaining Safety Functions should be prioritized as time permits
6. Identify success paths to be used to satisfy each safety function using BOTH of the following:
• Perform Resource Assessment Trees (RATS)
• Safety Function Tracking Page
7. Prioritize Safety Functions to be addressed first based on ALL the following:
a. Safety Functions which do not meet the Safety Function Status Checklist for the selected success path
b. Safety Functions for which the equipment to support the success path is not operating
c. Safety functions for which success path three has been selected
d. Safety functions for which success path two has been selected
e. Safety functions for which success path one has been selected</td></tr>
<tr><td colspan="3">Examiner Note: US performs RATs and determines CI-1 the correct path.</td></tr>
<tr><td colspan="3"><table>
<tr><th colspan="3">Resource Assessment Tree Evaluation</th></tr>
<tr><td>Reactivity Control</td><td>RC-1</td><td>MET</td></tr>
<tr><td>DC Power</td><td>DC-1</td><td>MET</td></tr>
<tr><td>AC Power</td><td>AC-1</td><td>MET</td></tr>
<tr><td>Inventory Control</td><td>IC-2</td><td>MET</td></tr>
<tr><td>Pressure Control</td><td>PC-2</td><td>MET</td></tr>
<tr><td>Heat Removal</td><td>HR-2</td><td>MET</td></tr>
<tr><td>Containment Isolation</td><td>CI-1</td><td>NOT MET</td></tr>
<tr><td>CTMT Temperature and Pressure Control</td><td>CTPC-1</td><td></td></tr>
</table></td></tr>
<tr><td></td><td>US</td><td>8. DIRECT STA to check that Safety Function Status Checklist Acceptance Criteria are satisfied for chosen success paths
9. PERFORM operator actions for chosen success paths based on priority assigned.</td></tr>
<tr><td colspan="3">Examiner Note: The crew transitions to EOP 2540E, Functional Recovery of Containment Isolation. CI-1</td></tr>
</table>

Op. Test No.: ES22LI1 Scenario No.: 3	Event No.: **8**	Page **17** of **20**
Event Description: EOP 2540E, Functional Recovery of Containment Isolation		
Symptoms/Cues: Directed by Diagnostic Flowpath		

	ATC	Check SIAS/CIAS Actuation 1. IF ANY of the following conditions exist: • Containment pressure is greater than or equal to 4.42 psig • Radiation monitors inside containment are greater than their alarm setpoint • An unexplained rise in containment radiation level or activity ENSURE the following: a. ENSURE SIAS, CIAS, EBFAS and MSI have actuated (C-01) b. CHECK at least one train of SIAS, CIAS, EBFAS and MSI have actuated (C-01X). **RESPONSE NOT OBTAINED** b.1 IF ANY component is *not* in its required position, manually ALIGN the applicable component. → **ATC starts 'C' HPSI pump** ← c. ENSURE ONE complete facility of CRACS operating in recirc mode: (C25) **Facility 1** • HV- 203A, Fan F- 21A exhaust damper is open. • Fan F- 21A, supply fan is running. • HV- 206A, Fan F- 31A exhaust damper is open. • Fan F- 31A, exhaust fan is running. • HV- 212A, Fan F- 32A exhaust damper is open. • Fan F- 32A, filter fan is running. • HV- 202, minimum fresh air damper is closed. • HV- 207, cable vault exhaust damper is closed. • HV- 208, exhaust air damper is closed. • ENSURE vital switchgear cooling is operating for each operating ECCS train. d. ENSURE vital switchgear cooling is operating for each operating ECCS train as follows: **Facility 1** • Fan F-51 is running • Fan F-134 is running • SW-178A, service water supply, is open • SW-178B, service water supply, is open **Facility 2** • Fan F-52 is running • Fan F-142 is running • Fan F-133 is running • SW-178C, service water supply, is open

Op. Test No.: ES22LI1 Scenario No.: 3	Event No.: **8**	Page **18** of **20**
Event Description: EOP 2540E, Functional Recovery of Containment Isolation		
Symptoms/Cues: Directed by Diagnostic Flowpath		

	US	Identify and Isolate SGTR 2. IF a SGTR is indicated by ANY of the following: • Steam generator activities • Main steam piping radiation levels • Steam generator level change when *not* feeding • Steam generator blowdown activity • Steam generator mismatch in level with essentially the same feed and steaming rate for both steam generators • Feed flow mismatch between steam generators • Steam flow versus feed flow mismatch in a steam generator prior to the trip • Steam flow to feed flow mismatch in a SG prior to the trip IDENTIFY and ISOLATE the most affected S/G. Refer To Appendix 12, SGTR Response.
Examiner Note: The crew transitions to EOP 2541, Appendix 12, SGTR Response.		
Critical Task: Cooldown the RCS to < 515˚F prior to isolating the affected S/G		
	BOP	Commence Cooldown to T_{HOT} Less Than 515˚F 1. CHECK Steam Dumps to Condenser available. **RESPONSE NOT OBTAINED** 1.1 COMMENCE a cooldown to a T_{HOT} of less than 515˚F in **BOTH** loops using EITHER of the following: • Operation of the ADVs from the control room • Operation of the ADVs locally <u>OR</u> at Hot Shutdown Panel, C-21, Using EOP 2541, Appendix 6, ADV Local Operation
	ATC	Reduce and Control RCS Pressure 2. DEPRESSURIZE the RCS in preparation for isolating the affected S/G by performing the following: a. CONTROL RCS pressure using heaters <u>AND</u> spray b. ESTABLISH <u>AND</u> MAINTAIN pressurizer pressure to meet ALL the following criteria: • Less than 920 psia • Within ± 50 psi of the most affected steam generator • Within the RCS P/T curve limits, REFER to EOP 2541, Appendix 2, Figures, Fig. 1 • <u>IF</u> the RCPs are operating, <u>THEN</u> maintain RCS pressure above the NPSH curve. REFER to EOP 2541, Appendix 2, Figures, Fig. 2 Block MSI actuation → no actions Block SIAS actuation → no actions
	BOP	CLOSE MSIVs on a LOOP → no actions

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3	Event No.: **8**	Page **19** of **20**
Event Description: EOP 2540E, Functional Recovery of Containment Isolation		
Symptoms/Cues: Directed by Diagnostic Flowpath		

	US	Determine the most affected S/G → **#2 S/G** 1. DETERMINE the most affected steam generator by considering all of the following: • Steam generator activities • Main steam piping radiation levels • Steam generator level rise when NOT feeding • Steam generator blowdown activity • Steam generator mismatch in level with essentially the same feed and steaming rate for BOTH steam generators • Feed flow mismatch between steam generators • Steam flow to feed flow mismatch in a SG prior to the trip

Form 3.3-2 Required Operator Actions

Op. Test No.: ES22LI1 Scenario No.: 3	Event No.: **8**	Page **20** of **20**
Event Description: EOP 2540E, Functional Recovery of Containment Isolation		
Symptoms/Cues: Directed by Diagnostic Flowpath		

Critical Task: Isolate the faulted S/G within 60 minutes of the SGTR (time of trip)		
	BOP	Isolate Most Affected Steam Generator 7. WHEN BOTH RCS T_{HOT} temperatures are less than 515˚F, THEN ISOLATE the most affected steam generator by performing the following: **Number 2 Steam Generator**
	US	a. RECORD in the placekeeper, time and T_{COLD} of operating loop _____ Time _____ T_{COLD} ˚F
	BOP	b. ENSURE **ALL** the following for #2 ADV: • ADV controller, PIC-4224, setpoint at 920 psia • ADV controller, PIC-4224, is in A • ATMOS DUMP, MS-190B – CLOSED • ADV, MS-190B, is closed **RESPONSE NOT OBTAINED** a.1 **CLOSE ANY** of the following: • 2-MS-3B, ADV manual isolation valve • 2-MS-190B, Atmospheric dump valve c. ENSURE the MSIV, MS-64B, is closed d. ENSURE the MSIV bypass valve, MS-65B, is closed e. UNLOCK and CLOSE “DISC FOR MS-202” (NS6202) f. CLOSE steam to turbine driven aux feed pump supply valve, MS-202 g. CLOSE BYPASS VLV, LIC-5216, main feedwater regulating bypass valve h. ENSURE the main feedwater block valve, FW-42B, is closed i. PLACE main feedwater isolation air assisted check valve, FW-5B, to “CLOSE” j. ENSURE the steam generator isolation valve, MS-220B, is closed k. PLACE BOTH auxiliary feed “OVERIDE/MAN/START/RESET” handswitches in “PULL TO LOCK” l. CLOSE the aux feedwater regulating valve, FW-43B m. PLACE aux feed isolation air assisted check valve, FW-12B, to “CLOSE” n. CLOSE main steam leg low point drain, MS-266B o. CHECK the main steam safety valves are closed p. RECORD time #2 steam generator isolated: Time
When the event has been addressed to the lead examiner’s satisfaction, the scenario is complete.		

SIMULATOR SCENARIO #4

Form 3.3-1 Scenario Outline

Facility:	Millstone Unit 2	Scenario #:	4
Scenario Source:		Op. Test #:	ES22LI1
Examiners:		Applicants/ Operators:	
Initial Conditions:	100% power, steady state operations, 'B' RBCCW pump in service on 'A' header. Buses 22C & 22D are cross-tied, bus 22C supplying.		
Turnover:	No equipment out of service. Swap RBCCW Pumps to 'A' in service, 'B' secured		
Critical Tasks:	1. Isolate Auxiliary Feedwater to affected S/G within 15 minutes of MSI signal. 2. Establish RCS temperature control prior to RCS temperature reaching 535˚F.		

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N - US/BOP TS - US	Swap RBCCW Pumps
2	N/A	N- ATC/US	Secure Enclosure Building Purge
3	RX03B	I - US/ATC	Pressurizer Pressure controller fails low
4	RD0304	C – BOP/US TS – US	Dropped CEA
5	NA	R - All	Rapid downpower
6	TU04C	M - All	Turbine Lube Oil leak (TRIP criteria)
7	MS01A		ESD on trip (#1 S/G, inside CTMT)
8	ES03F	C – ATC/US MC - ATC	'D' CAR fan does not start in Slow Speed
9	ES01B	C – BOP/US MC - BOP	'B' AFW pump does not start on Auto Aux. Feedwater signal.

* (N)Normal, (R)Reactivity, (I)Instrument, (C)Component, (M)Major, (TS)Tech Spec, (MC)Manual Control

Quantitative Attribute	Target per Scenario	Actual
Events after EOP entry	1–2	2
Abnormal events	2–4	5
Major transients	1–2	1
EOPs entered/requiring substantive actions	1–2	1
Entry into a contingency EOP with substantive actions	1 per **scenario set**	0
Pre-identified CTs	2 or more	2

Scenario Summary:

The crew will take the shift with the unit at 100% power, steady state, no equipment OOS (IC-21).

Event 1: The BOP swaps RBCCW pumps. The US logs into TSAS 3.7.3.1.

Event 9: The ATC secures Enclosure Building Purge in accordance with OP 2314B, Containment and Enclosure Building Purge; Section 11, Restoring from Enclosure Building Purge using Main Exhaust.

Event 2: Pressurizer Pressure Channel 'Y' (controlling channel) fails low. ARP 2590B-212 PZR PRESSURE SELECTED CHANNEL DEVIATION HI/LO directs the operator to select Pressurizer Pressure Channel X as the controlling channel

Event 3: CEA #4 drops. The BOP takes Immediate Actions to stabilize RCS temperature. The crew enters AOP 2556, CEA Malfunctions. The procedure directs the unit be down-powered to a power level less than 75%.

Event 4: The crew enters AOP 2575 and commences a downpower.

Event 5: The Turning Gear Oil pump starts due to low oil pressure, the crew enters AOP 2587, Turbine Lube Oil Leak. Bearing temperatures are increasing, requiring the turbine be tripped. The crew trips the reactor and turbine and enters EOP 2525, Standard Post Trip Actions. The 30-minute clock to secure feeding the affected S/G starts here.

Event 6: On the trip, an Excess Steam Demand occurs from the #1 S/G inside of CTMT. The crew diagnoses an ESD and transitions to EOP 2536, Excess Steam Demand

Event 7: The 'D' CAR fan does not start on the SIAS signal. The ATC takes actions to start the 'D' CAR fan in Slow Speed.

Event 8: 'B' AFW pump does not start on Auto Aux. Feedwater signal. The BOP starts the 'B' AFW pump

The scenario will end at the examiners discretion.

INPUT SUMMARY							
Either INPUT or VERIFY the following functions:							
ID Num	Description	Delay Time	Ramp Time	Event Trigger	Severity or Value	Final Value	Relative Order
MALFUNCTIONS							
C07-C26	TURBINE TGR OIL PUMP RUNNING			1			4
TU01A	LOSS OF LUBE OIL TO TURB BRG 1		60	2	20	20	4
TU01B	LOSS OF LUBE OIL TO TURB BRG 2		60	2	20	20	4
TU01C	LOSS OF LUBE OIL TO TURB BRG 3		60	2	20	20	4
TU01D	LOSS OF LUBE OIL TO TURB BRG 4		60	2	20	20	4
TU01E	LOSS OF LUBE OIL TO TURB BRG 5		60	2	20	20	4
TU01F	LOSS OF LUBE OIL TO TURB BRG 6		60	2	20	20	4
TU01G	LOSS OF LUBE OIL TO TURB BRG 7		60	2	20	20	4
TU01H	LOSS OF LUBE OIL TO TURB BRG 8		60	2	20	20	4
TU01I	LOSS OF LUBE OIL TO TURB BRG 9		60	2	20	20	4
TU01J	LOSS OF LUBE OIL TO TURB BRG 10		60	2	20	20	4
TU01K	LOSS OF LUBE OIL TO TURB BRG 11		60	2	20	20	4
TU03	SHAFT PP REDUCED CAPACITY		60	2	20	20	4
TU04C	TURB LUBE OIL PP (TGOP) FAIL		60	2	20	20	4
RX03B	PZR PRESS CNTL (PT-100Y) FAIL			3	1500	1500	2
RD0104	DROPPED CEA #4			4			3
MS01A	MN STM HDR #1 RUPTURE IN CTMT			30	1.66	1.66	5
ES03F	ESAS SIGNAL FAIL TO ACTUATE AM-615						0
ES01B	AUTO AFW B INITIATION FAIL			30			
REMOTE FUNCTIONS							
CCR40	CC PUMP SIAS/LNP BLOCK SW HS-6119D				NORM	NORM	1
OVERRIDES							
TU4463R2_2				1	R	R	4
TU4463G_1				1	NG	NG	4

Critical Task Elements

Critical Task Statement	Isolate Auxiliary feedwater to the affected S/G within 15 minutes of a MSI signal
Initiating Cue	EOP 2525, Standard Post Trip Actions, step 7. RCS Heat Removal, RNO step c.2 (S/G pressure < 572# AND ESD is in progress).
Performance Feedback	Affected S/G will boil dry once feedwater is isolated to it.
Success Path	Isolating feed to a faulted S/G reduces the amount of energy released to the CTMYT atmosphere, keeping CTMT within design limits.
Measurable Performance Standard	The operator places both OVERIDE/MAN/START/RESET switches in 'PULL TO LOCK' and both Auxiliary Feedwater regulating valves, FW-43A&B, are closed.

Critical Task Statement	Establish RCS pressure and temperature control to maintain the RCS less than 200˚F subcooling.
Initiating Cue	EOP 2525, Standard Post Trip Actions, step 7. RCS Heat Removal, RNO step c.3 (S/G boiled dry and CET temperature rising)
Performance Feedback	Opening the ADV for the unaffected S/G after the affected S/G boils dry transfers the RCS Heat Removal function to the unaffected S/G. CET temperatures will stabilize, the RCS will not cooldown or heat up.
Success Path	Setting the unaffected S/G's ADV's automatic setpoint to the saturation pressure associated with the CET temperature will stabilize RCS temperature.
Measurable Performance Standard	When the affected S/G boils dry, the operator reduces the unaffected S/G's ADV automatic setpoint to approximately the saturation pressure of the CETs (at the point where the affected S/G boiled dry) using either the PPC SPDS screen or the steam tables.

Event Description: Swap RBCCW pumps (‘A’ running, ’B’ secured)

Symptoms/Cues: OP 2330A, RBCCW System
Section 4.3, Shifting from ‘B’ RBCCW Pump to ‘A” RBCCW Pump

Time	Position	Applicant’s Actions or Behavior
	BOP	ENSURE the following: • “A’ RBCCW Pump breaker (A311) - Racked up. • P11A (‘A’ RBCCW Pump) - Pull-To-Lock • RB-211A, ‘A’ RBCCW Pump Suction valve ‘A’ Header – open • RB-4.1D, ‘Header ‘B’, Hx ‘B’ Outlet – closed • RB-251A, Pump discharge header A/B cross-tie - open
	US	LCO 3.7.3.1 REACTOR BUILDING CLOSED COOLING WATER SYSTEM Two reactor building closed cooling water loops shall be OPERABLE APPLICABILITY: modes 1, 2, 3 AND 4 ACTION: With one reactor building closed cooling water loop inoperable, restore the inoperable loop to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 36 hours. TRMAS 7.1.20 APPENDIX R SAFE SHUTDOWN REQUIREMENTS (14 day requirement)
Booth Operator: **When** directed by crew, **Insert** Trigger #**3** and **report** HS6119B in BLOCK • HS6119D to BLOCK		
	BOP	CHECK alarm window ‘RBCCW PUMP B SIAS/LNP START MANUALLY BLOCKED’ (C-06/7, AA-20) lit.
	BOP	START P-11A, RBCCW PP A. • Check normal amperage (30-44 amps) • Check discharge pressure (105-145 psig)
Booth Operator: **When** directed by crew to close RB-3B, **Report** valve closed		
	BOP	SECURE P-11B, RBCCW PP B, and PLACE in PULL-TO-LOCK CHECK alarms NOT lit: • ‘RBCCW PUMP B SIAS/LNP START MANUALLY BLOCKED’ (C-06/7, AA-20) • RBCCW HDR A FLOW HI (C-06/7, A-7)
Booth Operator: **When** directed by crew to open RB-3B, **Report** valve open		
	US	Log exit from: • TS LCO 3.7.3.1 • TRM 7.1.20
	BOP	ENSURE RBCCW header flow between 6,000 and 7,300 gpm (FI-6035) CLOSE RB-251A, Pump discharge header A/B cross-tie
Booth Operator: **When** directed by crew to verify proper RM flow, **Report** proper flows • ‘A’ RBCCW pump = 1.5 gpm, ‘C’ RBCCW pump = 1.5 gpm, FI-6038 = 3.0 gpm		
When the event has been addressed to the lead examiner’s satisfaction, proceed to the next event.		

Event Description: Securing Enclosure Building Purge

Symptoms/Cues: OP 2314B, Containment and Enclosure Building Purge;
Section 11, Restoring from Enclosure Building Purge using Main Exhaust

Time	Position	Applicant's Actions or Behavior
	ATC	Perform the following within 15 seconds of each other: • STOP F-23, Purge Supply Fan • Close AC-11, Purge Exhaust Filter outlet damper • Stop a Main Exhaust fan, F34A or F34B or F34C
	ATC	CLOSE the following dampers: • AC-1, Supply Fan • AC-3, Enclosure Building Supply • AC-8, Enclosure Building Exhaust
Examiner Note: TS-8155 is NOT bypassed		
When the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Event Description: Pressurizer Pressure Channel 'Y' (controlling channel) fails low.

Symptoms/Cues: PIC-110Y red indicator needle fails low, PIC-100Y controller needle fails low (to left), Pressurizer B/U Heaters energize, RCS pressure starts increasing

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger #**3** • RX03B, PZR PRESS CNTL (PT-100Y) Fail (0%)		
Examiner Note: The following annunciators will not be in alarm immediately but the crew can utilize them to mitigate the instrument failure: • ARP 2590B-212 PZR PRESSURE SELECTED CHANNEL DEVIATION HI/LO (C-02/3, D-37) • ARP 2590B-220, PRESSURIZER CH Y PRES HI/LO (C-02/3, D-39)		
	CREW	Checks Pressurizer pressure channels and operation of controllers and determines PIC-100Y controller has failed low
	US	Directs actions in either: • ARP 2590B-212, PZR PRESSURE SELECTED CHANNEL DEVIATION HI/LO **OR** • ARP 2590B-220, PRESSURIZER CH Y PRES HI/LO
	ATC	ENSURE PIC-100X is operating properly SHIFT Pressure control to Channel X
AFTER the BOP has seen the effects of the boration and commenced turbine load reduction **AND** the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Event Description: Dropped CEA (CEA #4)

Symptoms/Cues: Multiple alarms on C-04, Lowering RCS temperature, Lowering Reactor power

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger #**4** • RD0104, DROPPED CEA #4		
	BOP	Takes Immediate Actions for dropped CEA: • CHECK only one CEA has dropped • LOWER Main Turbine load to stabilize T_{COLD} • RESTORE T_{COLD} to within ± 2˚F of program
	US	Validate AOP 2585, Immediate Operator Actions were completed SAT. Transition crew to AOP 2556, CEA Malfunctions
Examiner Note: Crew transitions to AOP 2556, CEA Malfunctions		
	US	Determine trip Criteria met. → Trip criteria NOT met. US reviews trip criteria with crew: • Two or more CEAs are dropped **OR** • One dropped CEA AND one or more CEAs are misaligned **OR** • 2 or more CEAs are untrippable
	US	STOP any evolutions in progress
	ATC	VERIFY CEDM Control system is off
	US	Make notifications: • I&C → commence troubleshooting • Reactor Engineering • OMOC Proceed to Attachment D, Dropped or Misaligned CEA
	BOP	The following actions were completed in AOP 2585 LOWER Main Turbine load to stabilize T_{COLD} RESTORE T_{COLD} to within ± 2˚F of program
	US	RECORD CEA Drop Time RECORD CEA number DIRECT Attachment F, CEA Positions Data Sheet, be completed. LCO 3.1.3.1.1 CEA POSITIONS SURVEILLANCE REQUIREMENT 4.1.3.1.1 Verify the indicated position of each CEA to be within 10 steps of all other CEAs in its group at the frequency specified in the Surveillance Frequency Control Program AN within 1 hour following any CEA movement larger than 10 steps.
	US	CHECK Reactor power ≥ 75 %.

Event Description: Dropped CEA (CEA #4)

Symptoms/Cues: Multiple alarms on C-04, Lowering RCS temperature, Lowering Reactor power

	US	LCO 3.1.3.1 CEA POSITIONS All CEAs shall be OPERABLE with each CEA of a given group be positioned within 10 steps (indicated position) of all other CEAs in its group, and the CEA Motion Inhibit and the CEA Deviation Circuit shall be OPERABLE APPLICABILITY: modes 1* (1) and 2(1) ACTION: A.1 Reduce THERMAL POWER to < 70% of the maximum allowable THERMAL POWER within one hour and restore CEA(s) misalignment within 2 hours or otherwise be in MODE 3 within the next 6 hours (1) See Special Test Exception 3.10.2 (Does not apply)
	CREW	Transitions to AOP 2575, Rapid Downpower

Event Description: Rapid Downpower

Symptoms/Cues: None

Time	Position	Applicant's Actions or Behavior
Examiner Note: AOP 2575, Rapid Downpower, is entered.		
	US	Perform notifications
	ATC	Initiate forcing sprays • Places all B/U heaters to 'ON' • Adjusts PRES CNTL-Y, PIC 100Y thumbwheel to achieve 50% output
CAUTION: In the case of a dropped CEA, rod motion is **NOT** used to initiate downpower		
	US	Determine Reactivity Plan Availability → Borate from RWST using 2 Charging Pumps
	BOP	Set up Turbine controls (Attachment G) • Select 'Load Setpt' and enter desired value → 14%. • Select 'Rate Setpt' and enter desired value → 30%/hour
	ATC	Raise Charging Flow – No actions taken, both charging pumps running from Event #4
	ATC	Borate from the RWST a. CHECK Boration from RWST - SELECTED b. CHECK VCT MAKEUP BYPASS, CH-196 - CLOSED c. CHECK RWST TO CHG SUCT, CH-504 - OPEN d. OPEN RWST ISOL, CH-192 e. CLOSE VCT OUT ISOL, CH-501
	BOP	Reduce turbine load when effects of boron are seen. • When ready to commence load reduction, then select 'Load Resume'. • IF Turbine Load Ramp Rate needs to be adjusted, perform any of the following: ○ SELECT 'Rate Setpt' AND ENTER new value. ○ SELECT one of the following: 5%, 10%, or 20% per hour ○ SELECT Raise or Lower (0.25% / hour change). Maintain T_{COLD} within 2 °F of program
	ATC	Maintain VCT parameters • Level 70 – 90% • Pressure < 30 psig
	CREW	Maintain parameters as specified in Attachment A
AFTER the BOP has seen the effects of the boration and commenced turbine load reduction **AND** the event has been addressed to the lead examiner's satisfaction, proceed to the next event.		

Event Description: Turbine Lube Oil Leak

Symptoms/Cues: TURBINE TGR OIL PUMP RUNNING (C-06/7, C-26),
No indication of Turning Gear Oil Pump running, Bearing temperatures increasing

Time	Position	Applicant's Actions or Behavior
Booth Operator: **When** directed by Lead Examiner, **Insert** Trigger #**1 & 2** • C07-C26, TURBINE TGR OIL PUMP RUNNING • TU01A-K, LOSS OF LUBE OIL TO TURB BRG #1 ->> THRUST (to 20 in 60s) • TU03, SHAFT PUMP REDUCED CAPACITY (to 20 in 60s) • TU04C TURB LUBE OIL PUMP FAIL		
	US	REFER to ARP 2590E-143, TURBINE TGR OIL PUMP RUNNING
	BOP	OBSERVE P-62, Turning Gear Oil pump - operating CHECK turbine bearing oil pressure – normal Determine cause of pump start If cause of pump start is due to leak or rupture, GO TO AOP 2587, Turbine Oil Systems – Leak/Emergency Shutdown
	CREW	Transitions to AOP 2587, Turbine Oil Systems – Leak/Emergency Shutdown
	US	Determine trip Criteria met. → Trip criteria met. US reviews trip criteria with crew: • Main Bearing Oil Pressure < 13 psig. NOT MET • Turbine vibrations - > 12 mils AND Sustained. NOT MET • Turbine vibrations - > 10 mils for > 15 minutes. NOT MET • Turbine bearing temperatures increasing. MET
	CREW	Determines trip criteria met
Examiner note: Reactor is tripped, crew transitions to EOP 2525, Standard Post Trip Actions		

Event Description: Reactor Trip → EOP 2525, Standard Post Trip Actions

Symptoms/Cues: Directed by TURBINE TGR OIL PUMP RUNNING (C-06/7, C-26),

Time	Position	Applicant's Actions or Behavior
	ATC	Reactivity Control → Reactor Trip Ensure Reactor Trip
	BOP	Reactivity Control →Turbine Trip Ensure Turbine trip
	BOP	Maintenance of Vital Auxiliaries No Open Phase Condition All busses energized
	BOP	Maintenance of Vital Auxiliaries RBCCW and Service Water headers operating.
	ATC	RCS Inventory Control → Pressurizer level < 20% a. Pressurizer level is between 20 to 80%, trending to 35 to 70%. **RESPONSE NOT OBTAINED** a.1 Start the 3rd charging pump and secure Letdown b. RCS subcooling > 30 °F
	ATC	RCS Pressure Control a. CHECK that pressurizer pressure is 1900 to 2350 psia, trending to 2225 to 2300 psia. **RESPONSE NOT OBTAINED** • OPERATE the Pressurizer Pressure Control System. Manually OPERATE pressurizer heaters and spray valves. • IF pressurizer pressure is less than 1714 psia AND SIAS actuated, THEN ENSURE ONE RCP in each loop is stopped. →ATC will secure 2 RCPs due to SIAS actuation 1. 'RCP – A' and 'RCP – C' handswitches to 'STOP' **OR** 2. 'RCP – B' and 'RCP – D' handswitches to 'STOP' • **TCOA**: IF Pressurizer pressure lowers to less than the minimum of Fig. 2 "RCP NPSH Curve" THEN STOP ALL RCPs
	ATC	Core Heat Removal a. CHECK at least **1** RCP is operating, AND loop ΔT < 10 °F b. RCS subcooling > 30 °F

Event Description: Reactor Trip → EOP 2525, Standard Post Trip Actions

Symptoms/Cues: Directed by TURBINE TGR OIL PUMP RUNNING (C-06/7, C-26),

	BOP	RCS Heat Removal a. At least one S/G has BOTH of the following conditions met: • Level 10% to 80%. • Main feedwater or TCOA**:** TWO auxiliary feedwater pumps operating to restore level between 40% to 70%. **RESPONSE NOT OBTAINED** a.1 BOP takes action to start the 'B' MDAFW Pump. b. RCS T_{COLD} is being maintained between 530 °F to 535 °F **RESPONSE NOT OBTAINED** b.2 IF RCS < 530° F THEN confirm SG steam and feed rates are not excessive • Ensure Feed rate is not excessive • Stabilize RCS T_{COLD} using steam dumps or ADVs • If MSI as actuated and terminates the cooldown, THEN operate ADVs to stabilize T_{COLD}. c. BOTH S/G pressures are 880 to 920 psia. **RESPONSE NOT OBTAINED** c.1 IF any S/G pressure is < 572 psia, THEN ensure MSI is actuated c.2 TCOA: If any S/G pressure is < 572 psia and an ESDE is in progress, then perform the following to isolate AFW to the most affected SG: 1. Place both AFW OVERIDE/MAN/START/RESET handswitches in PULL-TO-LOCK 2. Close applicable AFW regulating valve (FW-43A) 3. If necessary, consider the use of FW-44 4. If necessary dispatch on operator to close FW-11A c.3 If any S/G pressure is < 572 psia and an ESDE is in progress, then perform the following: 1. Close #1 ADV 2. When #1 S/G boils dry, as indicated by CET temperatures rising, then operate #2 ADV to stabilize CET temperature 3. Proceed to step 8

Event Description: Reactor Trip → EOP 2525, Standard Post Trip Actions

Symptoms/Cues: Directed by TURBINE TGR OIL PUMP RUNNING (C-06/7, C-26),

	ATC	Containment Isolation – met a. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED – No actions** a.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS actuated. (C01) • CIAS actuated. (C01) • EBFAS actuated. (C01) • MSI actuated. (C01) ATC will secure 2 RCPs due to SIAS actuation 1. 'RCP – A' and 'RCP – C' handswitches to 'STOP' OR 2. 'RCP – B' and 'RCP – D' handswitches to 'STOP' b. No primary plant rad monitors have an unexplained rise or are in alarm c. No steam plant rad monitors have an unexpected rise or are in alarm
	ATC	Containment Temperature and Pressure Control – met a. CTMT temperature < 120 °F **RESPONSE NOT OBTAINED** a.1 ENSURE **ALL** available normal cooling and ventilation systems are OPERATING: • CAR fans operating on the facility with an operating train of RBCCW • CTMT Aux Circ fans b. CTMT pressure < 1.0 psig **RESPONSE NOT OBTAINED** b.1 IF containment pressure is greater than or equal to 4.42 psig, THEN ENSURE ALL of the following: • SIAS actuated. (C01) • CIAS actuated. (C01) • EBFAS actuated. (C01) • MSI actuated. (C01)
	ATC BOP	Perform Appendix 4, Reactor Trip Subsequent Actions
	US	Diagnose the event a. Diagnostic Flowchart directs operator to EOP 2536, Excessive Steam Demand.
Examiner note: Crew transitions to EOP 2536, Excess Steam Demand		

Event Description: EOP 2536, Excessive Steam Demand

Symptoms/Cues: Directed by Diagnostic Flowchart

Time	Position	Applicant's Actions or Behavior
	US	1. Confirm Diagnosis of Excess Steam Demand Event a. Using ATTACHMENT, A, Monitor Safety Function Status Check b. CHECK Acceptance Criteria - MET
	BOP	2. Sample Steam Generators and RCS: a. Align sample cooling as follows: 1. Check 'B' train RBCCW in service 2. Open RB-210, Sample Cooler isolation b. Open both S/G sample valves • SAMPLE ISOL VLV MS-191A • SAMPLE ISOL VLV MS-191B c. DIRECT Chemistry to sample both S/Gs for boron and activity d. Using EOP 2541, Appendix 46, Sampling for EAL Determination, DIRECT Chemistry to sample for EAL Determination <u>OR</u> CLASSIFY using alternative methods e. MONITOR the following for indications of S/G tube leakage: • Rise in SJAE activity or high activity alarm • Rise in S/G blowdown activity or high activity alarm • Rising S/G level when <u>NOT</u> feeding • Feed flow, steam flow mismatch • Main steam line radiation monitor alarm • N-16 radiation monitor alarm f. CHECK S/G sample valves open g. <u>WHEN</u> samples have been taken, <u>THEN</u> CLOSE both S/G sample valves (C-05) • SAMPLE ISOL VLV MS-191A • SAMPLE ISOL VLV MS-191B
		•
	US	3. REFER to MP-26-EPI-FAP06, Classification and PARS AND CLASSIFY the event 4. OPEN ATTACHMENT B, Placekeeper <u>AND</u> PERFORM the following: • RECORD EOP entry time _____ • PLACE Master Alarm Silence in NORMAL

	ATC	5. SIAS actuation a. CHECK the following ACTUATED: (C-01) • SIAS • CIAS • EBFAS b. Check one complete facility of CRAC is operating in Recirculation mode **Facility 1** • HV- 203A, Fan F- 21A exhaust damper - OPEN. • Fan F- 21A, supply fan - RUNNING. • HV- 206A, Fan F- 31A exhaust damper - OPEN. • Fan F- 31A, exhaust fan - RUNNING. • HV- 212A, Fan F- 32A exhaust damper - OPEN. • Fan F- 32A, filter fan - RUNNING. • HV- 202, minimum fresh air damper - CLOSED. • HV- 207, cable vault exhaust damper - CLOSED. • HV- 208, exhaust air damper - CLOSED. 6. Optimize Safety Injection a. CHECK at least one complete train of the following ACTUATED: (C-01X) • SIAS • CIAS • EBFAS b. Check SI pumps – RUNNING (C-01) c. REFER to EOP 2541, Appendix 2, Figures, Figure 3, Pre-SRAS Minimum required SI Flow, AND CHECK Safety Injection flow – ADEQUATE d. START all charging pumps e. CHECK Facility 1 ECCS Train - Operating f. CHECK Facility 1 Vital Switchgear is operating as follows: Lower 4160V switchgear room • Fan F- 134, LOWER 4160VAC SWITCHGEAR COOLING FAN, - ENERGIZED. • SW- 178B, COOLER x-182 CONTROL VALVE, - OPEN. West 480V switchgear room • Fan F- 51, WEST 480V SWGR RM COOLING FAN, - RUNNING • SW- 178A, COOLERS X-181A, X-181 SW CONTROL VALVE, - OPEN. g. CHECK Facility 2 ECCS Train - Operating h. CHECK Facility2 Vital Switchgear is operating as follows: Upper 4160V switchgear room • Fan F- 133, UPPER 4160VAC SWITCHGEAR COOLING FAN, - ENERGIZED. • SW- 178C, COOLER X-183 CONTROL VALVE, - OPEN. East 480V switchgear room • Fan F- 52, EAST 480V SWGR RM COOLING FAN, - RUNNING • F-142, EAST 480V SGWR RM EXHAUST FAN - ENERGIZED.

	BOP	7. Close MSIVs to Isolate Leak a. CHECK MSI – ACTUATED b. CHECK at least one train of MSI – properly ACTUATED (C-01X) c. OPEN CND VAC BKR, AR-17 (C-06)
	ATC	8. RCP Trip Strategy a. CHECK at least one RCP - OPERATING b. CHECK BOTH of the following conditions exist: • pressurizer pressure is less than 1714 psia AND • SIAS has actuated c. ENSURE ONE RCP in each loop is stopped. d. PLACE associated pressurizer spray valve controller in MAN AND CLOSE the applicable spray valve: • PZR SPRAY-1A, HIC-100E • PZR SPRAY-1B, HIC-100F e. REFER TO EOP 2541, Appendix 2, Figures, Fig. 2, RCP NPSH Curve, AND CHECK RCP NPSH is within limits.
	ATC	9. RCP Operating Within Limits a. CHECK at least ONE RCP operating b. REFER to EOP 2541, Appendix 22, RCP Operating Parameters, AND CHECK RCP limits satisfied c. CHECK both of the following – MET • RCS T_{COLD} – LESS THAN OR EQUAL TO 500 °F • All 4 RCPs – OPERATING **RESPONSE NOT OBTAINED → PROCEED TO step 10**
	US	10. Determine Most Affected Steam Generator Considering All Of The Following: (→ #1 S/G) • High steam flow from steam generators • Lowering steam generator pressures • Lowering steam generator levels • Lowering RCS cold leg temperatures

Event Description: EOP 2536, Excessive Steam Demand

Symptoms/Cues: Directed by Diagnostic Flowchart

	BOP	Isolate most affected S/G: a. Check ESDE leak path – REMAINS UNISOLATED. b. Check #1 S/G - MOST AFFECTED c. ISOLATE #1 S/G by performing the following: 1. Close #1 ADV by both of the following: (C-05 or C-21) • ADV controller, PIC-4223, in M • ATMOS DUMP, MS-190A – CLOSED 2. Place ADV Quick Open Permissive to 'OFF' 3. CHECK MSIV, MS-64A - CLOSED (C-05) 4. CHECK BYPASS, MS-65A - CLOSED (C-05) 5. CLOSE TDAFP SPLY VLV, MS-201 (C-05) 6. CHECK BLDN ISOL VLV, MS-220A CLOSED (C-05) 7. PLACE BOTH aux. feed OVERIDE/MAN/START/RESET handswitches in PULL TO LOCK (C-05) 8. CLOSE AFW FCV, FW-43A (C-05) 9. CLOSE AFW ISOL CK, FW-12A (C-05) 10. CLOSE FW REG BYPASS VLV, LIC-5215 (C-05) 11. CHECK BLK VLV, FW-42A - CLOSED (C-05) 12. CLOSE FW ISOL, FW-5A (C-05) 13. CLOSE MAIN STM LEG LOW PT DR, MS-265B (C-06/7) 14. CHECK Main Steam Safety Valves – CLOSED (C-05, PPC or local) 15. RECORD time #1 steam generator isolated: _____Time

When the event has been addressed to the lead examiner's satisfaction, the scenario is complete.

Form 4.1-PWR Pressurized-Water Reactor Examination Outline

Facility: Millstone Unit 2														Date of Exam: Fall 2022									
Tier	Group	RO K/A Category Points												SRO-Only Points									
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2		G		Total					
1. Emergency and Abnormal Plant Evolutions	1	4	4	2	N/A			4	3	N/A		1	18	3		3		6					
	2	2	1	1				1	1			2	8	3		1		4					
	Tier Totals	6	5	3				5	4			3	26	6		4		10					
2. Plant Systems	1	2	2	1	2	3	3	2	5	2	2	4	28	2		3		5					
	2	2	0	1	2	1	0	1	0	0	1	1	9	0	2	1		3					
	Tier Totals	4	2	2	4	4	3	3	5	2	3	5	37	4		4		8					
3. Generic Knowledge and Abilities Categories	CO			EC			RC		EM					CO	EC	RC	EM						
	2			2			1		1				6	2	2	1	2	7					
4. Theory	Reactor Theory					Thermodynamics																	
	3					3							6										

Notes: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control;
EM = Emergency Procedures/Plan

* These systems/evolutions may be eliminated from the sample when Revision 2 of the K/A catalog is used to develop the sample plan

** These systems/evolutions are only included as part of the sample (as applicable to the facility) when Revision 2 of the K/A catalog is used to develop the sample plan

Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (**RO**)

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery		X					EK 2.09 Knowledge of the relationship between a reactor trip and the AC distribution system	3.5	
000008 (APE 8) Pressurizer Vapor Space Accident	X						AK1.03 Knowledge of the operational implications and/or cause and effect relationships of the consequences due to a PZR vapor space leak as they apply to a pressurize vapor space accident.	4.0	
000009 (EPE 9) Small-Break LOCA				X			EA1.17 Ability to operate and/or monitor the PRT/quench tank as they apply to a Small-Break LOCA	3.2	
000011 (EPE 11) Large-Break LOCA				X			EA1.03 Ability to operate and/or monitor the following as they apply to a Large-Break LOCA: RCPs	3.9	
000015 (APE 15) Reactor Coolant Pump Malfunctions					X		AA2.15: Ability to determine and/or interpret the following as they apply to Reactor Coolant Pump Malfunctions: Natural Circulation Flow	3.2	
000022 (APE 22) Loss of Reactor Coolant Makeup	X						AK1.03: Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to Loss of Reactor Coolant Makeup: Relationship between charging flow and PZR level	3.6	
000026 (APE 26) Loss of Component Cooling Water			X				AK3.02 Knowledge of the reasons for the following responses and/or actions as they apply to loss of component cooling water: the automatic actions (alignments) within the CCWS resulting from the actuation of the ESFAS	3.9	
000027 (APE 27) Pressurizer Pressure Control System Malfunction		X					AK2.12 Knowledge of the relationship between a Pressurizer Pressure Control System Malfunction and the following systems or components: PZR code safety valves	3.7	
000029 (EPE 29) Anticipated Transient Without Scram					X		EA2.12 Ability to determine and/or interpret the following as they apply to an Anticipated Transient Without Scram: AFW flow	3.5	
000038 (EPE 38) Steam Generator Tube Rupture						X	2.4.18 Knowledge of the specific bases for emergency and abnormal operating procedures.	3.3	
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer		X					AK2.07: Knowledge of the relationship between a Steamline Rupture and the following systems or components: NIS	3.2	
000054 (APE 54; CE E06) Loss of Main Feedwater				X			AA1.05: Ability to operate and/or monitor the following as they apply to Loss of Main Feedwater: MFR regulating control valves	3.3	
000055 (EPE 55) Station Blackout	X						EK1.05: Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to a Station Blackout: Load Shedding	3.8	
000056 (APE 56) Loss of Offsite Power			X				AK3.02: Knowledge of the reasons for the following responses and/or actions as they apply to Loss of Offsite Power: Actions contained in AOPs	4.1	
000057 (APE 57) Loss of Vital AC Instrument Bus					X		AA2.21 Ability to determine and/or interpret the following as they apply to Loss of Vital AC Electrical Instrument Bus: RWST level	3.1	
000058 (APE 58) Loss of DC Power	X						AK1.03 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to Loss of DC Power: Effect of battery discharge rate on capacity	3.7	
000062 (APE 62) Loss of Service Water		X					AK2.04: Knowledge of the relationship between Loss of Service Water and the following systems or components: Chilled water systems	3.0	
000077 (APE 77) Generator Voltage and Electric Grid Disturbances				X			AA1.02 Ability to operate and/or monitor the following as they apply to Generator Voltage and Electric Grid Disturbances: Turbine/generator controls	3.6	
K/A Category Totals:	4	4	2	4	3	1	Group Point Total:		18

Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (**RO**)

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topics	IR	#
000001 (APE 1) Continuous Rod Withdrawal						X	2.2.42 Ability to recognize system parameters that are entry-level conditions for TS	3.9	
000024 (APE 24) Emergency Boration				X			AA1.09 Ability to operate and/or monitor the following as they apply to Emergency Boration: ECCS	3.5	
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation					X		AA2.12 Ability to determine and/or interpret the following as they apply to Loss of Intermediate Range Nuclear Instrumentation: Maximum allowable channel disagreement	3.1	
000037 (APE 37) Steam Generator Tube Leak	X						AK1.02 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to a Steam Generator Tube Leak: Leak rate versus D/P across tube	3.8	
000061 (APE 61) Area Radiation Monitoring System Alarms	X						AK1.02 Knowledge of the operational implications and/or cause and effect relationships of the following as they apply to Area Radiation Monitoring System Alarms: Adverse containment conditions	3.6	
000069 (APE 69; W E14) Loss of Containment Integrity						X	2.1.29 Knowledge of how to conduct system lineups, such as valves, breakers, or switches	4.1	
000076 (APE 76) High Reactor Coolant Activity			X				AK3.06 Knowledge of the reasons for the following responses and/or actions as they apply to High Reactor Coolant Activity: Actions contained in EOPs or AOPs for high reactor coolant activity	3.5	
(CE E09) Functional Recovery		X					EK2.13 Knowledge of the relationship between Functional Recovery and the following systems or components: Shutdown cooling system	3.5	
K/A Category Point Totals:	2	1	1	1	1	2	Group Point Total:	8	

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump								X				A2.06 Ability to (a) predict the impacts of the following on the Reactor Coolant Pump System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: CCWS malfunction	3.5	
004 (SF1; SF2 CVCS) Chemical and Volume Control				X								K4.10 Knowledge of Chemical and Volume Control System design features and/or interlocks that provide for the following: Minimum temperature requirements on borated systems	3.0	
005 (SF4P RHR) Residual Heat Removal		X									X	K2.02 Knowledge of electrical power supplies to the following: Containment isolation valves G (Component) 191008: Breakers, Relays and Disconnects K1.11: Control room indication of a breaker status	3.3 3.3	
006 (SF2; SF3 ECCS) Emergency Core Cooling			X						X			K3.03 Knowledge of the effect that a loss or malfunction of the Emergency Core Cooling System will have on the following systems or system parameters: CSS A3.06 Ability to monitor automatic operation of the Emergency Core Cooling System, including: Valve lineups	3.8 3.7	
007 (SF5 PRTS) Pressurizer Relief/Quench Tank								X				A2.01 Ability to (a) predict the impacts of the following on the Pressurizer Relief Tank/Quench Tank System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: A PORV that is stuck open, or code safety valve	4.5	
008 (SF8 CCW) Component Cooling Water	X					X						K1.06 Knowledge of the physical connections and/or cause and effect relationships between the Component Cooling Water System and the following systems: EDGs K6.14 Knowledge of the effect of the following plant conditions, system malfunctions, or component malfunctions on the Component Cooling Water System: Temperature control valves for loads cooled by CCW	3.8 3.3	
010 (SF3 PZR PCS) Pressurizer									X			A3.03 Ability to monitor automatic features of the Pressurizer Pressure Control System, including: PZR heater operation	3.3	
012 (SF7 RPS) Reactor Protection		X								X		K2.01 Knowledge of electrical power supplies to the following: RPS channels, components, and interconnections A4.07 Ability to manually operate and/or monitor in the control room: M/G set breakers	4.0 3.8	
013 (SF2 ESFAS) Engineered Safety Features Actuation							X					A1.02 Ability to predict and/or monitor changes in parameters associated with operation of the Engineered Safety Features Actuation System, including: Containment pressure, temperature, and humidity	3.9	
022 (SF5 CCS) Containment Cooling						X					X	K6.09 Knowledge of the effect of the following plant conditions, system malfunctions, or component malfunctions on the Containment Cooling System: ESFAS G(Component) 191004 Pumps K1.12 “Runout” of a centrifugal pump (definition, indications, causes, effects, and corrective measures)	4.0 2.7	
026 (SF5 CSS) Containment Spray					X							K5.03 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Containment Spray System: Stratification of liquids: concentrated sodiuim hydroxide solution has a higher specific gravity than weak boric acid solution; therefore, the two solutions must be vigorously mixed to make an effective spray	2.5	

PWR Examination Outline
Systems—Tier 2/Group 1 (**RO**) (continued)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
039 (SF4S MSS) Main and Reheat Steam					X							K5.10 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Main and Reheat Steam System: Use of T-ave. program control when steam dumping through atmospheric relief/dump valves, including T-ave. limits	3.6	
059 (SF4S MFW) Main Feedwater											X	G 2.1.45 Ability to identify and interpret diverse indications to validate the response of another indication.	4.3	
061 (SF4S AFW) Auxiliary/Emergency Feedwater								X				A.2.04 Ability to (a) predict the impacts of the following on the Auxiliary/Emergency Feedwater System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: AFW pump failure or improper operation	4.1	
062 (SF6 ED AC) AC Electrical Distribution					X			X				K5.04 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the AC Electrical Distribution System: Operation of a static inverter A2.16 Ability to (a) predict the impacts of the following on the AC Electrical Distribution System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: Degraded system voltages	3.1 3.7	
063 (SF6 ED DC) DC Electrical Distribution						X						K6.07 Knowledge of the effect of the following plant conditions, system malfunctions, or component malfunctions on the DC Electrical Distribution System: Loss of all AC power	4.3	
064 (SF6 EDG) Emergency Diesel Generator	X											K1.07 Knowledge of the physical connections and/or cause and effect relationships between the Emergency Diesel Generators and the following systems: EDG building ventilation system	3.3	
073 (SF7 PRM) Process Radiation										X		A4.04 Ability to manually operate and/or monitor in the control room: Alarm and/or interlock setpoint checks and adjustments	3.2	
076 (SF4S SW) Service Water											X	G (Component) 191006 Heat Exchangers and Condensers K1.13 Consequences of heat exchanger tube failure	2.9	
078 (SF8 IAS) Instrument Air				X								K4.05 Knowledge of the Instrument Air System design features and/or interlocks that provide for the following: Isolation of instrument air to containment	3.2	
103 (SF5 CNT) Containment								X				A2.06 Ability to (a) predict the impacts of the following on the Containment System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: High containment pressure	4.5	
053 (SF1; SF4P ICS*) Integrated Control							X					A1.01 Ability to predict and/or monitor changes in parameters associated with operation of the Integrated Control System, including: T-ave	3.9	
K/A Category Point Totals:	2	2	1	2	3	3	2	5	2	2	4	Group Point Total:		28

Form 4.1-PWR	PWR Examination Outline Systems—Tier 2/Group 2 (RO)											Page 5	Plant	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
002 (SF2; SF4P RCS) Reactor Coolant			X									K3.02 Knowledge of the effect that a loss or malfunction of the Reactor Coolant System will have on the following systems or system parameters: Fuel	4.3	
015 (SF7 NI) Nuclear Instrumentation											X	G 2.1.7 Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation	4.4	
016 (SF7 NNI) Nonnuclear Instrumentation										X		A4.03 Ability to manually operate and/or monitor in the control room: Removing a failed channel from the circuit logic	3.4	
017 (SF7 ITM) In-Core Temperature Monitor				X								K4.01 Knowledge of In-Core Temperature Monitor System design features and/or interlocks that provide for the following: Input to subcooling monitors	3.9	
027 (SF5 CIRS) Containment Iodine Removal	X											K1.02 Knowledge of the physical connections and/or cause and effect relationships between the Containment Iodine Removal System and the following systems: Containment	3.1	
034 (SF8 FHS) Fuel Handling Equipment				X								K4.02 Knowledge of Fuel Handling Equipment System design features and/or interlocks that provide for the following: Fuel movement	3.0	
056 (SF4S CDS) Condensate	X											K1 Knowledge of the physical connections and/or cause and effect relationships between the Condensate System and the following systems: IAS (Instrument Air System)	2.6	
072 (SF7 ARM) Area Radiation Monitoring					X							K5.03 Knowledge of the operational implications or cause and effect relationships of the following concepts as they apply to the Area Radiation Monitoring System: Containment Isolation	3.6	
086 (SF8 FP) Fire Protection							X					A1.06 Ability to predict and/or monitor changes in parameters associated with operation of the Fire Protection System, including: Lights and alarms	3.0	
K/A Category Point Totals:	2	0	1	2	1	0	1	0	0	1	1	Group Point Total:		9

Form 4.1-PWR | PWR Examination Outline | Page 2

Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (**SRO**)

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery						X	2.1.34 Knowledge of RCS or balance-of-plant chemistry controls, including parameters measured and reasons for the control	3.5	
000008 (APE 8) Pressurizer Vapor Space Accident						X	2.1.8 Ability to coordinate personnel activities outside the control room	4.1	
000009 (EPE 9) Small-Break LOCA					X		EA2.15 Ability to determine and/or interpret the following as they apply to a Small-Break LOCA: RCS parameters	3.8	
000025 (APE 25) Loss of Residual Heat Removal System					X		AA2.07 Ability to determine and/or interpret the following as they apply to the Loss of the Residual Heat Removal System: Pump cavitation	4.0	
000057 (APE 57) Loss of Vital AC Instrument Bus						X	2.2.43 Knowledge of the process used to track inoperable alarms	3.3	
000065 (APE 65) Loss of Instrument Air					X		AA2.07 Ability to determine and/or interpret the following as they apply to Loss of Instrument Air: Determination of whether backup nitrogen supply is controlling the valve position	3.2	
K/A Category Totals:					3	3	Group Point Total:		6

Form 4.1-PWR | PWR Examination Outline | Page 3

Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (**SRO**)

E/APE # / Name	K1	K	K	A	A2	G	K/A Topic(s)	IR	#
000032 (APE 32) Loss of Source Range Nuclear Instrumentation					X		AA2.01 Ability to determine and/or interpret the following as they apply to Loss of Source Range Nuclear Instrumentation: Normal and/or abnormal power supply operation	3.0	
000067 (APE 67) Plant Fire On Site					X		AA2.12 Ability to determine and/or interpret the following as they apply to Plant Fire on Site: Location of vital equipment within fire zone	3.6	
(CE A16) Excess RCS Leakage					X		AA2.06 Ability to determine and/or interpret the following as they apply to Excess RCS Leakage: RCS temperature and pressure	3.5	
(CE E13*) Loss of Forced Circulation/LOOP/Blackout						X	2.1.20 Ability to interpret and execute procedure steps	4.6	
K/A Category Point Totals:					3	1	Group Point Total:		4

Form 4.1-PWR | PWR Examination Outline | Page 4

Plant Systems—Tier 2/Group 1 (**SRO**)

System # / Name	K1	K2	K3	K4	K5	K	A1	A2	A	A4	G	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump								X				A2.01 Ability to (a) predict the impacts of the following on the Reactor Coolant Pump System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: Problems with RCP seals, especially seal leakoff rates	4.0	
004 (SF1; SF2 CVCS) Chemical and Volume Control											X	2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management	4.6	
061 (SF4S AFW) Auxiliary/Emergency Feedwater											X	2.2.42 Ability to recognize system parameters that are entry-level conditions for TS	4.6	
063 (SF6 ED DC) DC Electrical Distribution											X	2.4.17 Knowledge of emergency and abnormal operating procedures terms and definitions	4.3	
053 (SF1; SF4P ICS*) Integrated Control								X				A2.08 Ability to (a) predict the impacts of the following on the Integrated Control System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: Plant computer failure	3.2	
K/A Category Point Totals:								2			3	Group Point Total:		5

Form 4.1-PWR | PWR Examination Outline | Page 5

Plant Systems—Tier 2/Group 2 (**SRO**)

System # / Name	K1	K 2	K 3	K4	K 5	K 6	A 1	A2	A 3	A 4	G	K/A Topics	IR	#
033 (SF8 SFPCS) Spent Fuel Pool Cooling								X				A2.03 Ability to (a) predict the impacts of the following on the Spent Fuel Pool Cooling System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: Abnormal water level	3.7	
035 (SF 4P SG) Steam Generator								X				A2.02 Ability to (a) predict the impacts of the following on the Steam Generator System and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operations: Reactor trip/turbine trip	4.2	
072 (SF7 ARM) Area Radiation Monitoring											X	2.1.35 Knowledge of the fuel handling responsibilities of SROs (SRO Only)	3.9	
K/A Category Point Totals:								2			1	Group Point Total:		3

Form 4.1-COMMON Common Examination Outline

Facility: Millstone U2		Date of Exam: Fall 2022				
Generic Knowledge and Abilities—Tier 3 (RO/SRO)						
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.30	Ability to locate and operate components, including local controls	4.4			
	2.1.32	Ability to explain and apply system precautions, limitations, notes, or cautions	3.8			
	2.1.25	Ability to interpret reference materials, such as graphs, curves, and tables (reference potential)			4.2	
	2.1.40	Knowledge of refueling administrative requirements			3.9	
	Subtotal		-	2	-	2
2. Equipment Control	2.2.12	Knowledge of surveillance procedures	3.7			
	2.2.13	Knowledge of tagging and clearance procedures	4.1			
	2.2.5	Knowledge of the process for making design or operating changes to the facility, such as 10 CFR 50.59, “Changes, Tests and Experiments,” screening and evaluation processes, administrative processes for temporary modifications, disabling annunciators, or installation of temporary equipment			3.2	
	2.2.20	Knowledge of the process for managing troubleshooting activities			3.8	
	Subtotal		-	2	-	2
3. Radiation Control	2.3.12	Knowledge of radiological safety principles and procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, or alignment of filters	3.2			
	2.3.11	Ability to control radiation releases			4.3	
	Subtotal		-	1	-	1
4. Emergency Procedures/ Plan	2.4.2	Knowledge of system setpoints, interlocks, and automatic actions associated with emergency and abnormal operating procedure entry conditions	4.5			
	2.4.4	Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures			4.7	
	2.4.51	Knowledge of emergency operating procedure exit conditions (e.g., emergency condition no longer exists or severe accident guideline entry is required)			4.0	
	Subtotal		-	1	-	2
Tier 3 Point Total				**6**		**7**

Form 4.1-COMMON Common Examination Outline (continued)

Theory—Tier 4 (RO)

Category	K/A #	Topic	RO	
			IR	#
Reactor Theory	6	192002 K1.07 Define K-eff and discuss its relationship to the state of a reactor (critical, subcritical, and supercritical)	3.1	
	6	192006 K1.03 Describe the production of xenon-135	2.8	
	6	192005 K1.09 Describe the effect on the magnitude of control rod worth for a change in the following: fission product poisons	2.8	
	Subtotal		-	3
Thermodynamics	6	193009 Core Thermal Limits K1.07 Describe factors that affect peaking and hot channel factors	3.3	
	6	193001 Thermodynamic Units and Properties K1.01 Convert between absolute and gauge pressure and vacuum scales	2.7	
	6	193008 Thermal Hydraulics K1.23 Describe means by which natural circulation can be enhanced	4.1	
	Subtotal		-	3
Tier 4 Point Total				**6**